April 26, 1934

FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD

Founded in 1909 by Stanley Spooner

DEVOTED TO THE INTERESTS, PRACTICE AND PROGRESS OF AERIAL LOCOMOTION AND TRANSPORT

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1322. Vol. XXVI. 26th Year. APRIL 26, 1934 Weekly, Price 6d. Post Free, 7½d. Abroad, 8d.

EDITORIAL, ADVERTISING, AND PUBLISHING OFFICES:

Dorset House, Stamford Street, London, S.E.1

Telegrams: "Truditur, Watloo, London."
Telephone: Hop 3333 (50 lines).

Subscription Rates, Post Free.

UNITED KINGDOM	s.	d.	OTHER COUNTRIES	s.	d.
3 Months ..	8	3	3 Months ..	8	9
6 " ..	16	6	6 " ..	17	6
12 " ..	33	0	12 " ..	35	0

CONTENTS

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

Apr. 23-27. 35th International Aviation Conference, Geneva.
Apr. 26. "Landing in Fog." Lecture by Dr. Rüd Stüssel before R.Ae.S.
Apr. 27. A.I.D. Technical Staff 9th Annual Dinner, Holborn Restaurant.
Apr. 27-May 6. International Aero Show, Geneva.
May 7-12. International Air Post Exhibition, Royal Horticultural Hall, Westminster.
May 10. "Speed and the Future of Commercial Aircraft." Lecture by M. Louis Breguet before R.Ae.S.
May 17-June 2. Royal Tournament, Olympia.
May 18. Entries close at ordinary fee for King's Cup Race.
May 21. Air Display, Loughton Aerodrome, Essex.
May 24. Empire Air Day.
May 27. Deutsch de la Meurthe Cup.
May 30. Entries close at double fee for King's Cup Race.
May 31. "Stalling." Wilbur Wright Memorial Lecture, by Prof. B. Melvill Jones, before R.Ae.S.
June 1. Entries close at 12 noon for London-Melbourne Race.
June 2. Brooklands Air Race Meeting.
June 3. London Aeroplane Club Garden Party, Hatfield.
June 9. Reading Ae.C. Annual "At Home."
June 16. R.A.F. Reserve Flying Club Annual Flying Display, Hatfield.
June 23. Lancashire Ae.C. Air Display, Woodford.
June 23. Henly Rally, Heston Airport.
June 30. Royal Air Force Display, Hendon.

The Singapore–Brisbane Contracts

AUSTRALIA, and in fact the whole Empire, may be congratulated on the decision of the Commonwealth Government to accept the tender of the Qantas Empire Airways (the company formed by Imperial Airways and Qantas) for the Singapore-Brisbane section of the great trunk airway. The company will be truly Australian, not merely because it is registered in the Commonwealth, but because it will largely depend for its successful working over the inland stage on the great experience gained by Qantas during the last decade in flying over that tract of country. In addition, it will have behind it the equally great experience of Imperial Airways in operating Empire air lines, as well as the large resources of that company. No other company could have given the Australian taxpayer, who is finding the subsidy, such good value for his money.

This section of the great Empire air line is not, however, a purely Australian interest, even though Australia is finding the subsidy money for the whole section eastward from Singapore. It is only what we should have expected of Australia that she should wish to pay her share of what is a matter of concern to the whole Empire. It is the habit of that great Dominion to rise to the responsibilities of her partnership in the Empire. Others besides Australians are concerned that the air mails should go from England through Egypt, Iraq, India, Burma, and Malaya to Australia in the most efficient manner. New Zealand is likewise interested, for it can only be a matter of time before the airway is carried on across the Tasman Sea. The best results are to be expected where there is uniformity in spirit and in methods of operation and organisation. Imperial Airways by themselves will not control this airway, any more than they by themselves control the airway across India from Karachi. They share the work on that Indian section with Indian Transcontinental Airways. But even though Imperial Airways only share the responsibility with a partner, they are able to ensure uniformity in methods, and that is of very great importance if the mails are to go through with the minimum of checks.

Brisbane is not the southern terminus of the airway in Australia. Under present arrangements that is to be at Cootamundra in New South Wales, a railway junction from which the mails will be distributed by old-fashioned methods of transport to Sydney, Melbourne, and Adelaide. This arrangement has a temporary appearance, for the obvious course would seem to be a coast route from Brisbane down to Sydney and Melbourne. Local considerations, which are not quite obvious to people outside Australia, have decided on Cootamundra as the terminus, and a special contract has been given for the section Charleville-Cootamundra. The successful tenderer is Mr. C. A. Butler, who won fame by his solo flight to Australia. He has been a pilot in the service of Australian National Airways, which, under the direction of Mr. Ulm and Sir Charles Kingsford Smith, ran a successful unsubsidised line between Sydney and Brisbane, and afterwards other less successful lines, but Mr. Butler has no experience of managing an air company. Presumably, he must have substantial people behind him.

The most extraordinary feature of the new contracts is the grant of the contract Perth-Katherine to the MacRobertson Miller Aviation Co., to the exclusion of West Australia Airways, which, under the direction of Major Norman Brearley, has done such very fine work along the West Coast of Australia for so many years past. Sir Macpherson Robertson's company has owned a couple of aeroplanes for some time past (they bought the very first "Giant Moth" with "Jupiter" engine), while Mr. Miller has also been doing some air taxi work round Adelaide. But everybody thought that Major Brearley had made the West Coast route his own. He has developed it in a remarkable fashion, and his services have won a wonderful reputation for safety and regularity. We must confess to a feeling of great regret that he is no longer one of the air mail contractors in Australia.

For many years Australia, thanks to a wise official policy and to the great work of Qantas and West Australia Airways, led the Empire, not to say the world, in the matter of really useful air lines. She has now taken a very great step forward, and we feel sure that as time goes on she will benefit ever more and more by the services which can be rendered by air transport.

Airmen or Chairmen?

LAST Thursday Air Commodore Fellowes read a very interesting paper before the Royal Aeronautical Society, which is reported on another page. At the conclusion of it he delivered himself of a diatribe on what he called "a veritable canker in the control of British aviation." The essence of his complaint was that people who are in control of flying operations do not always fly themselves. The origin of this state of affairs was, he said, that in the war squadron leaders and higher ranks were ordered not to cross the lines, as they were considered indispensable. The present trouble, apparently, is that the chairmen of air transport companies are not always airmen, though it was not made quite clear whether Air Commodore Fellowes would pass as adequate, a chairman who travels as a passenger by air. Sir Eric Geddes, chairman of Imperial Airways, recently flew to South Africa. Is he an objectionable chairman because he has not taken an "A" licence? Some pilots, notably Mr. Hudson Fysh, of Qantas, and Maj. Brearley, of West Australia Airways, have made excellent and successful managing directors of companies. Other pilots who have started flying concerns have lacked business ability and have not made money out of their efforts. The ability to handle a joystick does not always connote business acumen, and generalisations on such points are not always proofs of true wisdom.

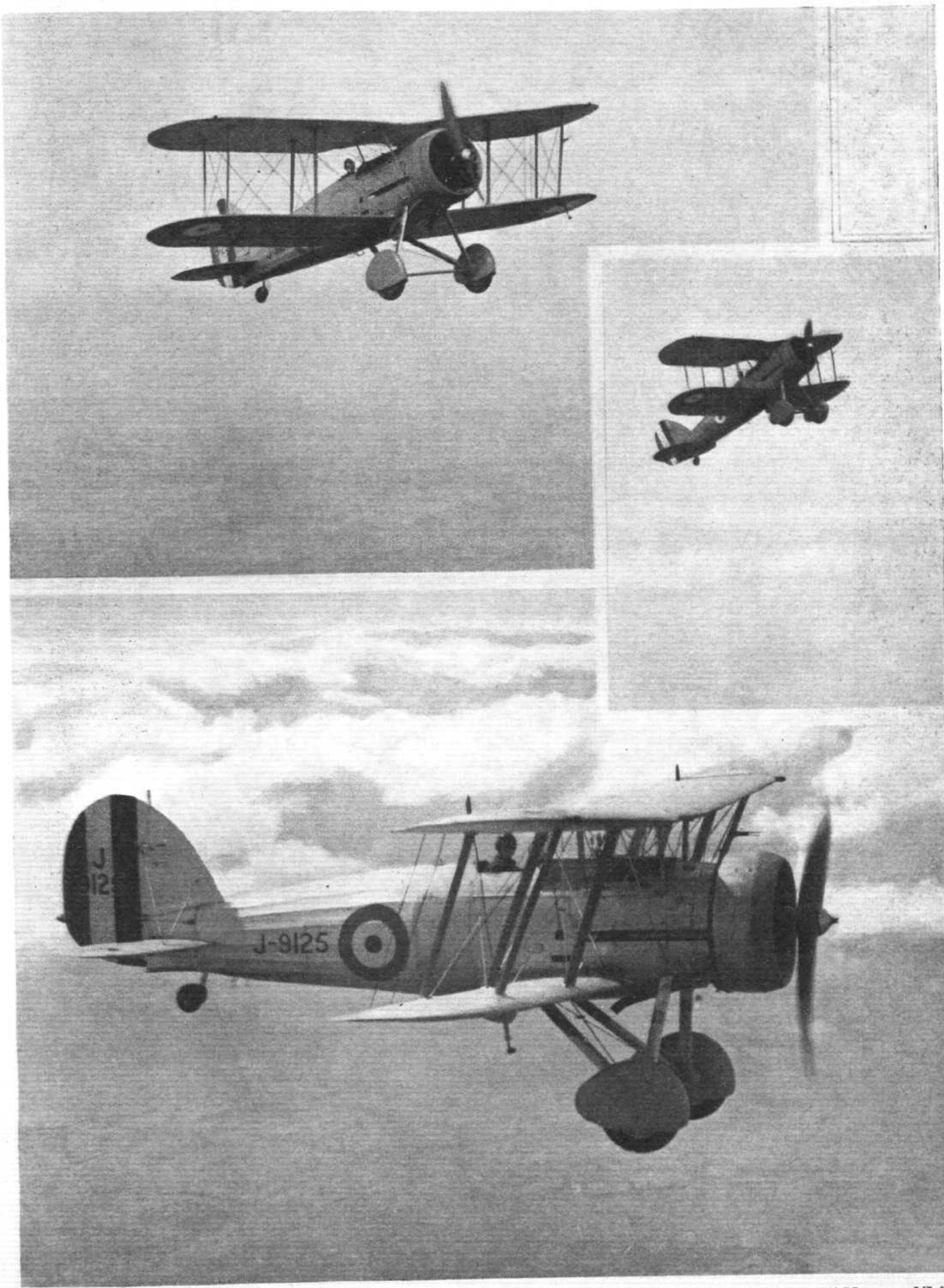
The N.A.A. and the MacRobertson Race

WE commented briefly in our last issue on the action of the National Aeronautic Association of Washington in sending to the Press a circular complaining that American aeroplanes which have received a "R" licence from the Department of Commerce were to be barred from the MacRobertson race to Australia. We explained that there was no question of the Royal Aero Club barring any machine. The club is obliged by regulation 5 to see that every competing aircraft has received from the certifying authority of its own country a certificate to the effect that it conforms "substantially" to the minimum airworthiness requirements of the International Convention for Air Navigation (I.C.A.N.). In the case of the United States the certifying authority is the Department of Commerce. If that body issues the necessary certificate to an entrant, it will be accepted without question by the Royal Aero Club of the United Kingdom.

The club has, however, published an explanatory memorandum, explaining that by the word "substantially" it is intended that all competing aircraft shall comply strictly with all major requirements affecting airworthiness and safety, such as main load factors and take-off requirements, the certifying authorities being left a discretionary latitude as to exact compliance with minor requirements. If American would-be entrants who possess fast racing machines can persuade their own Department of Commerce to give the necessary certificate, they will be accepted as entrants by the Royal Aero Club. It is not, however, the business of the club to inquire whether an American "R" licence or "N.R." licence conforms with the airworthiness requirements of the I.C.A.N. That responsibility rests on the U.S. Department of Commerce.

The N.A.A. is the representative of the Fédèration Aèronautique Internationale in the United States, corresponding in that respect to the Royal Aero Club here. It has addressed a letter dealing with the above points to the Duke of Atholl as President of the Royal Aero Club, which was dated April 9. The circular to which we alluded above was dated April 6. As an example of courtesy and correct behaviour from one official body to another, this sequence is rather striking, and further comment would be superfluous.

"GLOVES OFF"



14087

14089

14086

TRYING IT OUT : The Gloster "Gauntlet" shown in these photographs is fitted with the Bristol "Mercury VI" engine and a special Townend ring. The pilot was Capt. Saint. (FLIGHT *Photo.*)

A NEW SYWELL CHAPTER

New aerodrome, new club-house and many other benefits for the members of the Northampton Flying Club.

LT. COL. F. C. SHELMERDINE, the Director of Civil Aviation, with Mrs. Shelmerdine, visited the new premises of the Northampton Flying Club on Sunday, April 22. He did so on the occasion of the first official use of the club by members. The new aerodrome lies alongside the old one at Sywell, but is both larger and more level. Now, in its finished state, it makes a really excellent landing ground. The club buildings consist of a delightful club-house, designed by Mr. Graham Dawbarn, which is very like a small edition of the club-house at Brooklands. All the old private lock-ups and hangars which used to be on the other aerodrome, and also a new one, have been transferred to the new aerodrome. They have been re-erected on a different plan so that they are close together, and make a very compact and convenient lay-out. The new hangar is the work of a local contractor, and is made of steel framing covered with corrugated asbestos sheets

Flt. Lt. T. Rose (right), the Instructor at Sywell, talking to Mr. E. Davis, Manager of the Cinque Ports Flying Club at Lympne. (FLIGHT *Photo.*)

Flt. Lt. T. Rose is the instructor-in-charge, and he is already finding that the new facilities are attracting many new members. At the present time he has one "Moth" kept solely for club use, and he can call upon another when he wants it from the parent company of the club at Brooklands. There is also an arrangement by which the machines of some of the Club's private owners are available for use by other members.

The Northampton Club is now perhaps one of the most delightful and attractive of our clubs. Members of other clubs will deny that it is any more attractive than their own, but Sywell certainly ranks as one of the most modern and up-to-date in its general arrangement. Attached to the club there are two hard tennis courts, and other sporting facilities are planned for the time when the membership warrants the expenditure upon them. The internal decoration of the club-house is unlike any other club, and the bar, in particular, demands notice.

Sunday was a glorious summer-like day, and although the occasion was not widely advertised, some thirty aeroplanes arrived during the afternoon. They came from all parts of the country and included every known variety of machine which is ordinarily used for private flying. Taken all round it was a happy augury for the opening of the Club. At tea time there were several hundred visitors, including those who had flown over, and friends of members. Also, the general public, who showed great interest and lined the road adjoining the aerodrome, were allowed in to inspect the machines.

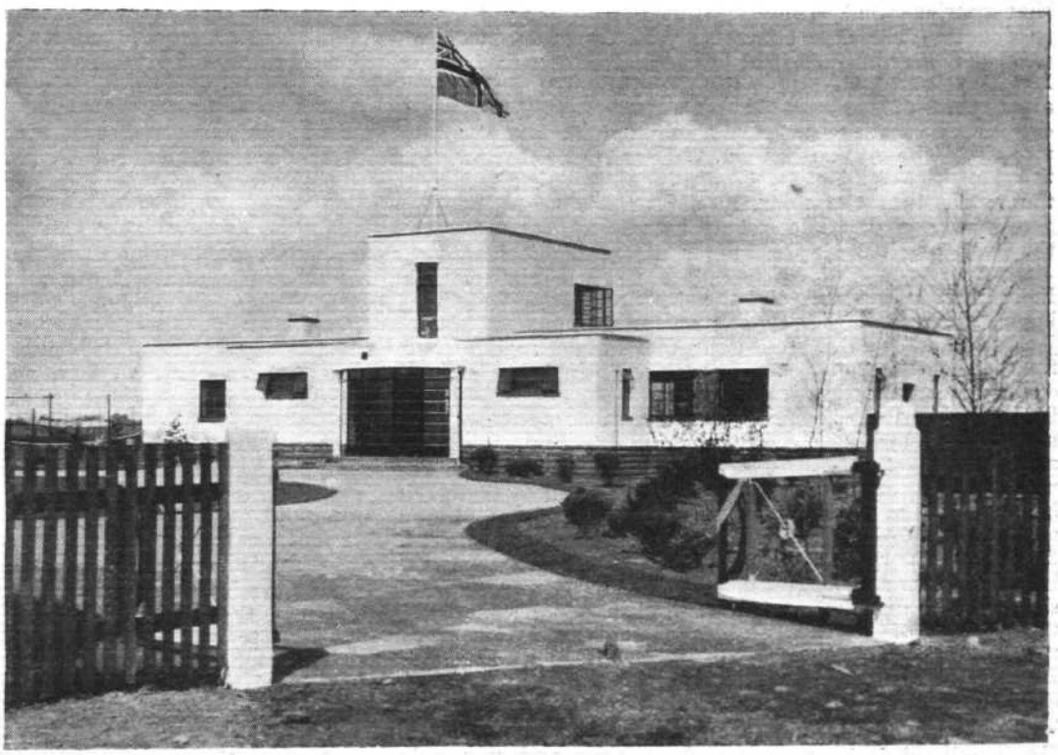
Sywell hospitality has, in the past, been one of the high spots in civil aviation. Their Annual Flying Meeting has always been one of the best attended and, what is equally important, one of best organised. The brothers Linnell have a flair for finding new and often amusing "turns" with which to entertain the crowd, and the club members—the lady members in particular always proving most efficient in looking after the culinary part of the entertainment—in general combine to make the Sywell meetings outstanding. We hope that they will continue their traditions under the new regime, as they should have added scope for their genius.

There was no organised flying display on Sunday, and the only "thrills" were, apart from the landing instruction which Capt. Duncan Davis gave to a lady member during the afternoon, an aerobatic display given by Mr. George Lowdell on one of the Hawker "Tomtits," which are now the property of Wolseley Motors, and are used for testing the new Wolseley engines. The one he brought to Sywell had the direct-drive nine-cylinder engine with an output of 185 h.p., so naturally it gave the "Tomtit" a spectacular performance, of which he took full advantage. Col. and Mrs. Shelmerdine flew to Sywell in a "Puss Moth" piloted by Mr. G. W. Ferguson. Col. Shelmerdine always flies when he can as befits his position as D.C.A.

A group outside the club-house at Sywell. In front, wearing a hat, can be seen Col. F. C. Shelmerdine, with Mrs. Shelmerdine on his right and Capt. H. D. Davis on his left. Behind the latter are Lord and Lady Willoughby de Broke. In the centre is Mr. G. R. D. Shaw, with Mrs. Shaw on his left and Mr. and Mrs. Mollison on his right. On Mr. Mollison's right is Mr. Eric Davis, with Mrs. Davis (in light coat) in front of him. Flt. Lt. Rose is on the right of the photograph standing on the steps. (FLIGHT *Photo.*)

AT SYWELL

The new aerodrome and buildings are in the foreground and adjoin the old aerodrome which lies at the top of the picture.



On the right is an impression of the club-house from the road.

Below is a view showing some of the machines which visited the Club on Sunday afternoon. On the extreme left is the Mollisons' "Dragon."
(FLIGHT *Photos.*)

THE HOUSTON-EVEREST FLIGHT

A resume of a lecture about the "Houston-Everest Flight" which Air Commodore Fellowes, the leader of the expedition, delivered before the Royal Aeronautical Society on April 19, 1934. Lord Sempill presided and the hall was more than filled to its capacity.

ON Thursday, April 19, Air Commodore P. F. M. Fellowes delivered an extremely interesting lecture before the Royal Aeronautical Society. He pointed out that, although the adventurous aspect of flying over the highest mountain in the world was that which primarily filled their minds at the start, it was very soon that the scientific outlook became more important, and after Capt. Uwins had secured the world's record for height by taking a Vickers "Vespa" ("Pegasus") to 44,000 ft., it became apparent that a fully equipped two-seater could be used for the expedition. Despite the backing of the India Office and the Viceroy it was found very difficult to obtain permission from the Nepalese authorities for the expedition to fly over Nepal, and it was only when these were convinced that a forced landing was in the highest degree unlikely, that they consented to one flight directly in and out from Everest, with a possibility of a second flight if the first one was completely successful.

Col. Blacker was the originator of the idea, and Col. Etherton and Lord Clydesdale assisted him with the preliminary organisation. The question of funds was solved by the sum of £15,000 which Lord Clydesdale induced that patriotic and far-seeing benefactress, Lady Houston, to donate. The date on which these funds became available was November 16, and it was decided from a meteorological point of view that the flight could not take place after April 15, or possibly May 1, so that the complete organisation had to be carried through in less than five months. The authorities at Westlands, at Bristol, and those of the Williamson Company all collaborated, with the result that the majority of the equipment was got ready only a day and a-half before the s.s. *Dalgoma*, the last possible ship, left for Karachi. Each aircraft was taken to 35,000 ft. in a temperature of minus 75 deg. Fahrenheit in England, and the electrically heated clothing, boots, gloves and goggles, oxygen circuits, camera heating jackets, and camera re-loading heaters, were found to function satisfactorily, an important point, as had the electrical supply failed, there would have only been a battery to fall back upon, which would not have been sufficient for heating more than the oxygen circuits, goggles and camera. 2,250 litres of oxygen were carried as the main supply and 750 litres as the auxiliary supply, it having been established that each man required 8 litres a minutes at 34,000 ft. if he were to remain efficient. Dealing with the question of a supply of oxygen, the lecturer referred to an occasion when Mr. Bonnet suffered shortage of oxygen due to a broken pipe while over the summit of Everest, and to a similar occasion when the lecturer himself was at 35,000 ft. in England. Bonnet was able to retain consciousness by winding his handkerchief around the break. Flt. Lt. MacIntosh also knocked the microphone from the front end of his mask, but luckily discovered it in time and was able to replace it and hold it with his hand until he got back to the aerodrome again. It was very evident at the conclusion of the flights that the pilots who were behind comfortable windscreens in still air and who had nothing to do except fly the machine, did not suffer to the same extent as the observers who had to handle heavy cameras and to stand up while they took photographs. It was also interesting to learn that the personnel were tested in a vacuum tank at Farnborough before the flight under similar conditions to those experienced at a height of 37,000 ft.

The cameras used were (*a*) a Williamson Eagle III type, electrically controlled and operated automatic camera. The focal length was 5 in. and the film exposure 5 × 5 in. The length of film was 125 ft., giving 140 exposures, and one re-load was carried. (*b*) A Newman Sinclair 34 m. spring driven cinema camera and 1,200 ft. of film was carried. (*c*) A Williamson P.14 8 in. focal length 5 in. by 4 in. plate camera. (*d*) A Williamson Pistol plate camera, focal length 2¼ in., plate size 3¼ in. by 2¼ in. Alpha K.1 and K.2 filters were used. Despite the elaborate heating arrangements for the cameras, considerable difficulty was experienced, as it was impossible to spend sufficient time on their preparation in England. The Infra-red photographs were obtained by slinging a special camera of 25 in. focal length in the Westland P.V.3 machine in the position intended for the torpedo. An exposure of 1/60th of a second was used and, considering the difficulties involved, the photographs were surprisingly good.

Small aircraft were used for the flight out from England after the two main aircraft had been shipped by boat, partly because small aircraft were required for cloud reconnaissance and similar purposes, and partly as a means of keeping the personnel in flying practice.

The dust, which was met with even up to a height of 19,000 ft., gave a great deal of trouble and could only be combated by constant cleaning, the Zip fastened fabric panels in the fuselage being mentioned as invaluable from this point of view. The Bristol "Pegasus" engines gave no trouble at all and provided 235 h.p. at 2,080 r.p.m. at 35,000 ft. Cooling problems on the long climb did not present insuperable difficulty, and the highest temperature obtained on a full power maximum angle climb was 219 deg. C. Neither the Potts oil coolers, nor the barometric throttle control gave any trouble. Wooden airscrews were used, as it was felt that they were cheaper, several different models could be built and changed easily and they were kinder to the engines. Wakefield's Aero C. oil and Shell Special Fuel, having an octane value of 80, were used. No spares of any kind were used and the K.L.G. plugs functioned satisfactorily the whole time.

Meteorological stations at Purnea and Darjeeling assisted with the meteorological side of the expedition.

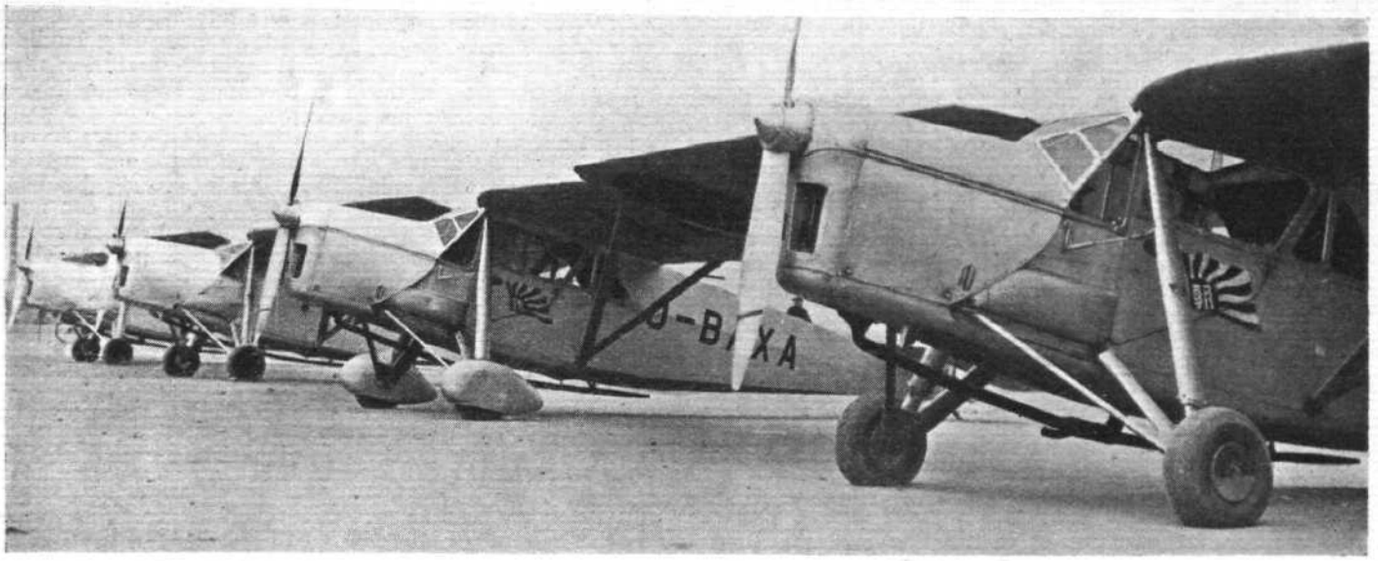
It was decided to equip each aircraft with a vertical automatic camera and the observer in one machine should devote himself to obliques while the other would do cinema photography. It was proposed to attempt to take a double vertical strip into and out from the summit by both aircraft, and to take obliques of the country each side. This was justified, as after the event it was only possible to tie up and plot the verticals by use of the obliques. The photographic aspect of the expedition was fully dealt with in the Royal Geographical Society's journals of January, 1933, and February, 1934. The lecturer did not think that the survey results obtained were of much value from a mapping point of view, but at the same time provided valuable data to any survey of mountains in the future.

AIR-COMMODORE FELLOWES, before replying to the discussion, took the opportunity to express his personal thanks to Lord Sempill for having presided. He recalled that Lord Sempill had been intimately in touch with the whole organisation of the expedition and had rendered great help, and he had taken charge of the organisation here while the expedition was in India.

Commenting on the remarks of Mr. Wimperis concerning the accelerometer reading of 5.6 g., obtained in America, he said it was obtained by Maj. Doolittle, flying at 180 miles per hour, when he had run into very bad weather. When the result was reported to the authorities in Washington they would not believe him. There were two accelerometers on the machine, however, one of which was sealed, and when that was opened it was found that the reading was practically the same. So that the figure of 5.6 g. was verified.

Replying to the question as to how long the work in connection with the expedition occupied, he said that tremendous work was done by three people, from about the beginning of 1932 until November of that year, in collecting and sifting data, tackling people to collect money and finding the various technical details. It was not until November 16, 1932, that the money was obtained so that things could actually be paid for. The expedition occupied exactly six months from that date until the members had reached home, on May 16, 1933. The preparations in England had occupied only two and a-half months, up to the time the aircraft was loaded.

Air Transport & Commerce



BRITISH AIR TRANSPORT IN JAPAN: Four D.H. "Puss Moths" owned and operated by the "Osaka Asahi," the Japanese newspaper.

K.N.I.L.M. DURING 1933

THE annual report of K.N.I.L.M. (Royal Netherlands Indian Airways) has just been published. Taking into account the unfavourable economic conditions, the results obtained during 1933 give cause for satisfaction. The number of passengers carried equals that of 1933, the amount of freight carried was increased by 5 per cent. and air mail by 25 per cent. The detailed returns are as follows:—

Route	Passengers	Goods, in kg.	Air Mail and Parcels in kg.
Batavia–Bandoeng (twice daily)	2,836	29,613	883
Bandoeng–Batavia (twice daily)	3,027	12,749	836
Batavia–Semarang–Sourabaya (daily)	1,408	5,071	5,771
Sourabaya–Semarang–Batavia (daily)	1,547	7,782	5,319
Batavia–Palembang–Singapore (weekly) ..	280	5,309	505
Singapore–Palembang–Batavia (weekly) ..	276	1,375	669
Batavia–Palembang–Pakan Baroe–Medan (weekly)	289	5,591	5,182
Medan–Pakan Baroe–Palembang–Batavia (weekly)	211	1,341	1,830
Medan–Alor Star (weekly), since May 4, 1933	39	74	1,273
Alor Star–Medan (weekly), since May 4, 1933	43	45	1,278
Special flights	568	118	733
Joyrides	2,554	—	—
	13,078	69,068	24,279

During 1933, 2,294 flights were made in 5,339 hours and 536,678 miles were flown.

When, in May, 1933, the K.L.M. Company took the Singapore route on their Amsterdam-Batavia service, K.N.I.L.M. opened a weekly service between Medan and Alor Star, connecting in both directions at the latter port with K.L.M. At the same time departures from Batavia and from Amsterdam were fixed for Wednesdays after the arrival of the K.N.I.L.M. machine from Sourabaya and Semarang. During the operation of the winter time-table of K.L.M., which commenced on November 1, machines from Holland arrived in Batavia on Saturdays. Since then, if possible, K.N.I.L.M. have made connection on the day of arrival to Semarang and Sourabaya with a special aeroplane.

The Netherlands Indian Government found that it was impossible to provide for the organisation of new air routes, and the subsidy granted to K.N.I.L.M. has been reduced for the period January 1, 1934, to January 1, 1937, by 60 per cent.

Excepting for the Bandoeng and Medan lines, regularity has been 100 per cent. on all lines. Unusually bad weather prevented the crossing of the Preanger Mountains on two occasions. On the Bandoeng line regularity was 99.76 per cent., but the softness of the landing ground at Pakan Baroe caused damage to the undercarriage of one machine and prevented its reaching Medan on the same day, thus reducing the regularity on the Medan line to 99.04 per cent.

No new aircraft were ordered during 1933. On December 31, 1933, the fleet of the company consisted of two Fokker F.VIIb's (three Bristol "Titan"), four Fokker F.VIIb's (three Siddeley "Lynx") and two Fokkers F.XII (three Pratt & Whitney "Wasps").

Assistance was given to a number of privately-owned aircraft, most of which were on their way to and from Australia. Only one large transport machine passed through Netherlands India, this being the A.W. XV *Astraea* of Imperial Airways making a reconnaissance flight to Australia.

As passengers on the Bandoeng line are mostly holiday makers the decrease during 1933 was not unexpected. The Medan line report a slight decrease in the number of passengers carried, whereas the results obtained on the Sourabaya and Singapore services compare favourably with those obtained during 1932. About 50 per cent. of the number of passengers travelled by return ticket. Among the prominent passengers carried were H.E. the Governor-General of Netherlands India, H.E. the Governor of the Straits Settlements, Prins Paribatra of Siam, and the ex-Governor of the Philippines.

Fares between Batavia and Bandoeng have been reduced. In December a system was introduced by which at the end of each year passengers receive a rebate according to the amount which they have flown.

Among the sight-seeing trips made were flights to the craters of Tangkoeban-Prahoe, Sibajak and Slamat. A special flight was made from Batavia to Semarang to convey an urgently-required serum, and another flight was made from Batavia to Muntok to take medical assistance to a sick child. Yet another flight was made for the purpose of tracing a motor boat which had been lost at sea.

HIGHLAND AIRWAYS SUMMER SERVICES

THE first internal air service of the British Isles celebrates its first birthday on May 8. Highland Airways, of Inverness, nearly a year ago launched an experimental service from Inverness to Kirkwall, in the Orkney Isles, with a four-seater twin-engined monoplane. The North of Scotland, which has not had the opportunity of becoming inti-

mate with flying, as is the case in the South, was sceptical, and strong barriers of reserve had to be broken down. The first two months was the critical test, but as the service was maintained with clocklike regularity against continuous days of fog, the lead of the more daring who had tried this service out with considerable satisfaction was followed, and the public suddenly took on. In consequence a larger aeroplane had to be put into operation in July last year to cope with the traffic. This service has been maintained all through the winter on a restricted timetable in probably the most stormy part of the British Isles, and for the first time in history passengers from Orkney have been able to reach Inverness the same afternoon in time to catch the south-bound train. Passengers carried for the first eleven months of operation number over 2,000, and 51,000 miles have been flown. Two tons of newspapers have been carried, and the service, including the winter months, has operated with 95 per cent. regularity.

On May 1 the summer timetable comes into force, and the service will operate daily from Inverness to Wick and Kirkwall at 10.15 a.m. A new service is to be commenced from Aberdeen to Wick and Kirkwall, and the time of departure will be the same, namely, 10.15 a.m., reaching Kirkwall at 12.00 midday. A further service is to be established between Kirkwall and the outer Orkney Isles, including the following islands:—Longhope, Hoy, Westray, Sanday, Stronsay, North Ronaldshay. Out of the whole Orkney group, South Ronaldshay is the only island which has refused to show any interest in air transport. All the other islands have eagerly assisted by providing landing grounds, and these islands are to obtain facilities that will enable days to be saved in travelling to the mainland as a reward for their progressiveness.

The fleet of aeroplanes is being increased to three seven-seaters with twin motors developing 260 h.p., and capable of cruising at 110 m.p.h. The fares are being brought down for return tickets, and a whole day's travel can now be accomplished in an hour or so at really economical rates.

There are many thousands of would-be visitors to Orkney who have hesitated to make the journey on account of the difficulties in reaching their objective. This is all changed now, and rapid facilities are offered. An interesting brochure is being prepared, and can be obtained on application to Highland Airways, Inverness.

BY AIR TO AUSTRALIA

Plans for Through Route now completed

LAST week the Federal Cabinet accepted the Singapore-Australia tenders, and Qantas Empire Airways will run the service with five four-engined D.H.86's for a period of five years. Curiously enough, D.H. "Dragons" and 86's are to be used by the operators of the three internal divisions, from Katherine to Perth, from Charleville to Cootamundra, and from Melbourne to Hobart via King Island. Mr. C. A. Butler, who, it will be remembered, flew a Comper "Swift" out to Australia in record time, made the successful tender for the second of the two additional branch routes. Regular lines now cover more than a million miles in Australia, and a fourteen-day service between London and Brisbane will start in December. The service between Singapore and Darwin will first be run experimentally for three months, and no fare-paying passengers will be carried during this period.

The Federal Government is co-operating with Qantas in planning new landing grounds, larger aerodromes, luxury hotels and quarantine stations.

U.S. AIR TRAFFIC

AIRLINES operated by Americans, both in the U.S.A. and abroad, have returned the following figures for 1933:—

	Mileage	Passengers	Passengers in U.S.A.	Express	Express in U.S.A.	Air Mail
1933 ..	54,642,545	568,940	493,141	2,452,812 lb.	62%	7,816,532 lb.
1932 ..	50,932,967	549,000	—	1,600,821 lb.	—	7,908,723 lb.

It is stated that 504 aircraft were being used on scheduled airlines and that 6,273 persons (543 pilots, 206 co-pilots, 2,320 mechanics, 1,834 hangar and field personnel and 1,370 office and operations staff) were employed. The average cost of a 367-mile flight was about 6.1 cents (2½d.) a mile per passenger. About 95 per cent. of the schedules were maintained.

NEW AIR SERVICE FROM MONTREAL

A REGULAR daily air service has just been established between Montreal and Boston, U.S.A., with stops at Burlington, Montpelier-Barre, White River Junction, Vermont, and at Concord and Manchester, New Hampshire. The service, maintained by tri-motored airliners, is operated by Central Vermont-Boston-Maine Airways. The opening flight from St. Hubert airport outside Montreal to Boston was begun in a snowstorm and against head winds for the first hundred miles. The trip was accomplished, including stops, within the scheduled time of three hours.

U.S. AIR MAILS

ALTHOUGH the American air lines have lost their air mail contracts, aircraft operating over their routes continue to carry mails. Several companies are now under contract to carry letters as "express" and to post the letters when they reach their destination. As the result of this arrangement there has been a big increase in the amount of express carried, and one line records an increase of 120 per cent. since February 19, when the transport of air mail was taken over by the U.S. Army Air Corps. Provided the correct postage is paid on each letter, the new procedure is perfectly legal.

BRAZILIAN AIR TRANSPORT

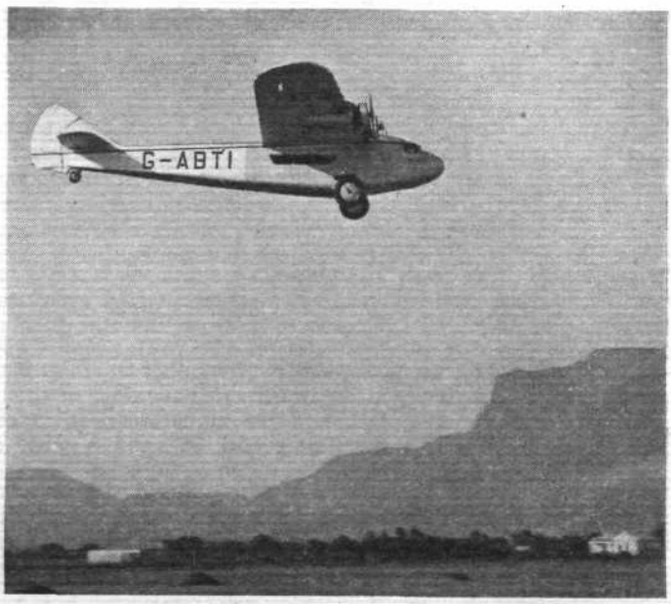
FIVE commercial aircraft of American manufacture have been ordered by the Brazilian Government for service on internal air lines. The Brazilian sea board is served by foreign air traffic companies so that it has been necessary for the Government to establish only internal lines, of which there are now five. Three of these lines last year carried about 7,000,000 lb. of mail over 200,000 miles without any serious accident.

LINDBERGH TO MANAGE NEW AMERICAN COMPANY?

RUMOURS are current in the U.S.A. that Col. Lindbergh will be manager of a new company which is to be formed to take over the equipment of Transcontinental & Western Air, in order to become eligible for the new temporary air mail contracts. Once an air mail contract has been cancelled another cannot be granted for at least five years. T.W.A., however, have denied the report.

D.L.H.'s NEW WORKSHOPS

AT Staaken Aerodrome, near Berlin, the Deutsche Luft Hansa are building new workshops for the repair and overhaul of aircraft. A site with a total area of 57,000 sq. ft. has been reserved.



"ATALANTA" IN AFRICA: Imperial Airways' *Atalanta* leaving Capetown with passengers and mails for England. Note Table Mountain in the background.

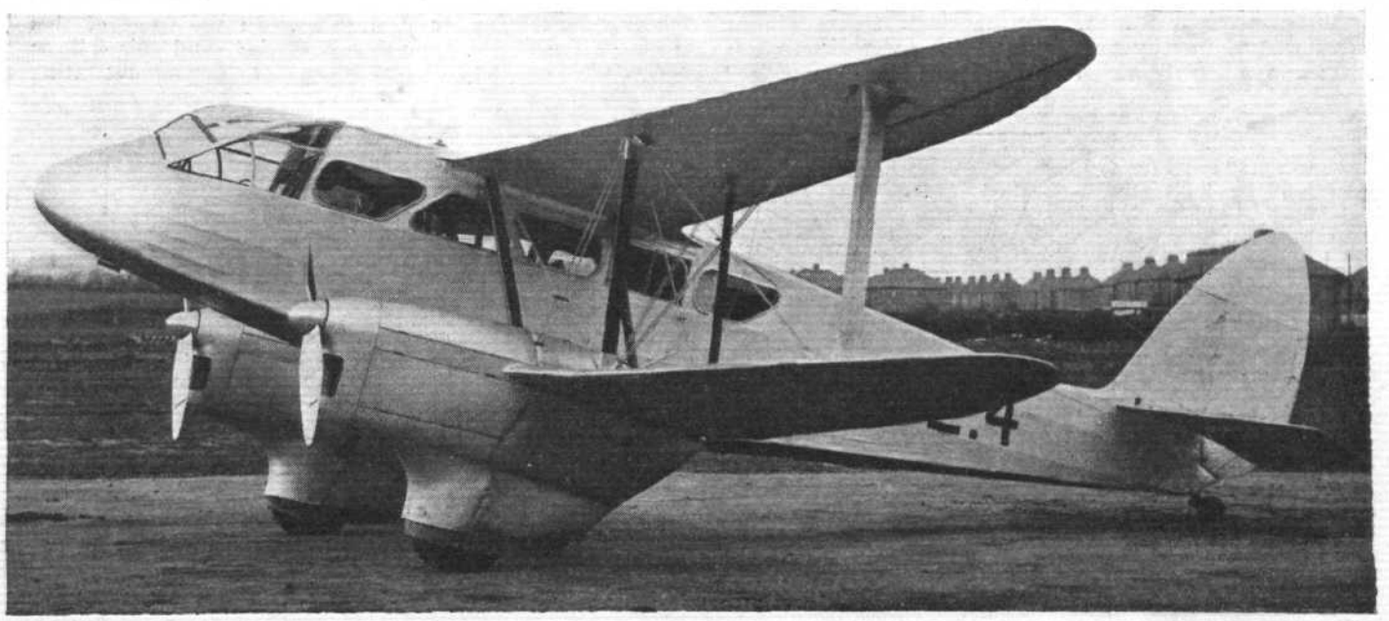
THE DE HAVILLAND "DRAGON SIX"

This week we are able to publish the first details to be released of an aeroplane developed to cater for the speeding up of air lines similar to those in this country. It is the inevitable result of steady development

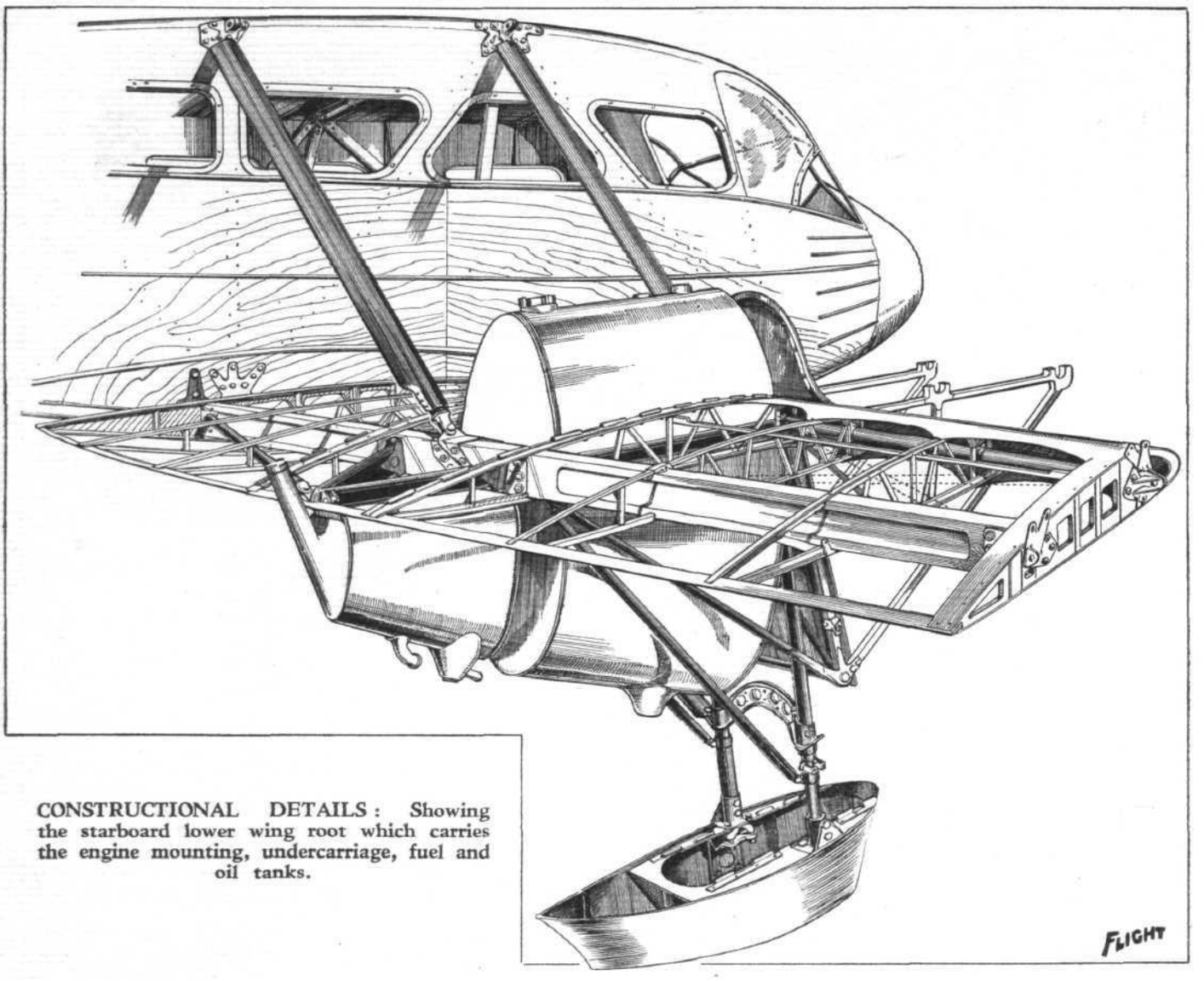
SWITZERLAND is to receive the first "Dragon Six," as the model which is herein described has been bought by Herr R. Herzig, of the Ostschweiz Aero Ges. for operation on the line St. Gaul, Zurich and Berne, which will connect with the lines to Marseilles and Barcelona. Another of these new machines will also soon be on its way to South Africa.

The "Dragon Six," or D.H.89, to give it its works designation, is obviously the outcome of improving a standard "Dragon" in the light of knowledge gained with the four-engined D.H.86, which was described in FLIGHT of February 22, 1934. It resembles the latter machine perhaps even more than the standard "Dragon," because those improvements very largely consist of alterations to external features, of the kind which immediately catch the eye. For example, the wings are very like those of the D.H.86, that is, heavily tapered, with wire bracing in the front bay only. Similarly, each engine is mounted over one unit of the landing gear in a most distinctive manner. As will be seen from the table, by these improvements and by the use of two "Gipsy Six" engines, the cruising speed has been raised to 140 m.p.h. *(225 km/h)*, and the machine has quite a considerable ceiling on one engine with full load. From a consideration of these main details it is immediately obvious that the "Dragon Six" is a machine which is particularly suitable for the development of air services in all parts of the world.

The wing construction does not differ very much from that used in the D.H.86. The biplane structure is braced by one pair of streamline-section steel tube struts and one built-up steel strut of similar section. This strut is, incidentally, spot welded, a manufacturing process which de Havillands have not so far used very extensively. The top planes have spindled spruce spars throughout their entire length and each is in one piece as far as the root fittings either side of the top of the fuselage. The bottom wings have spars of the same construction as far as the pair of inter-plane struts. Inside those, the surface is in the form of a bottom centre section which carries the engines and



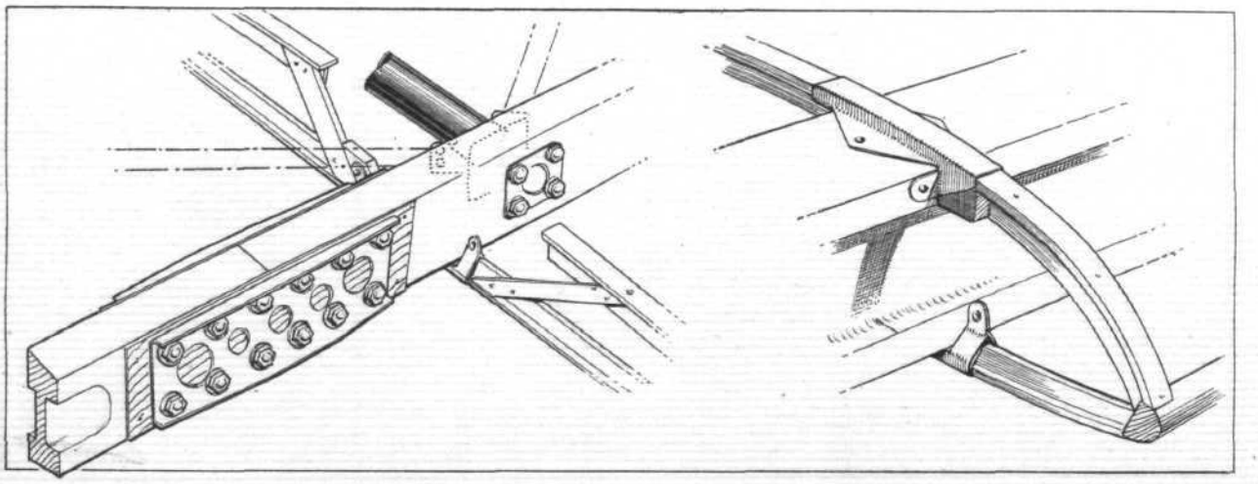
SPEEDY AND ROOMY: Two views of the "Dragon Six" taken recently at Stag Lane. (FLIGHT *Photos.*)



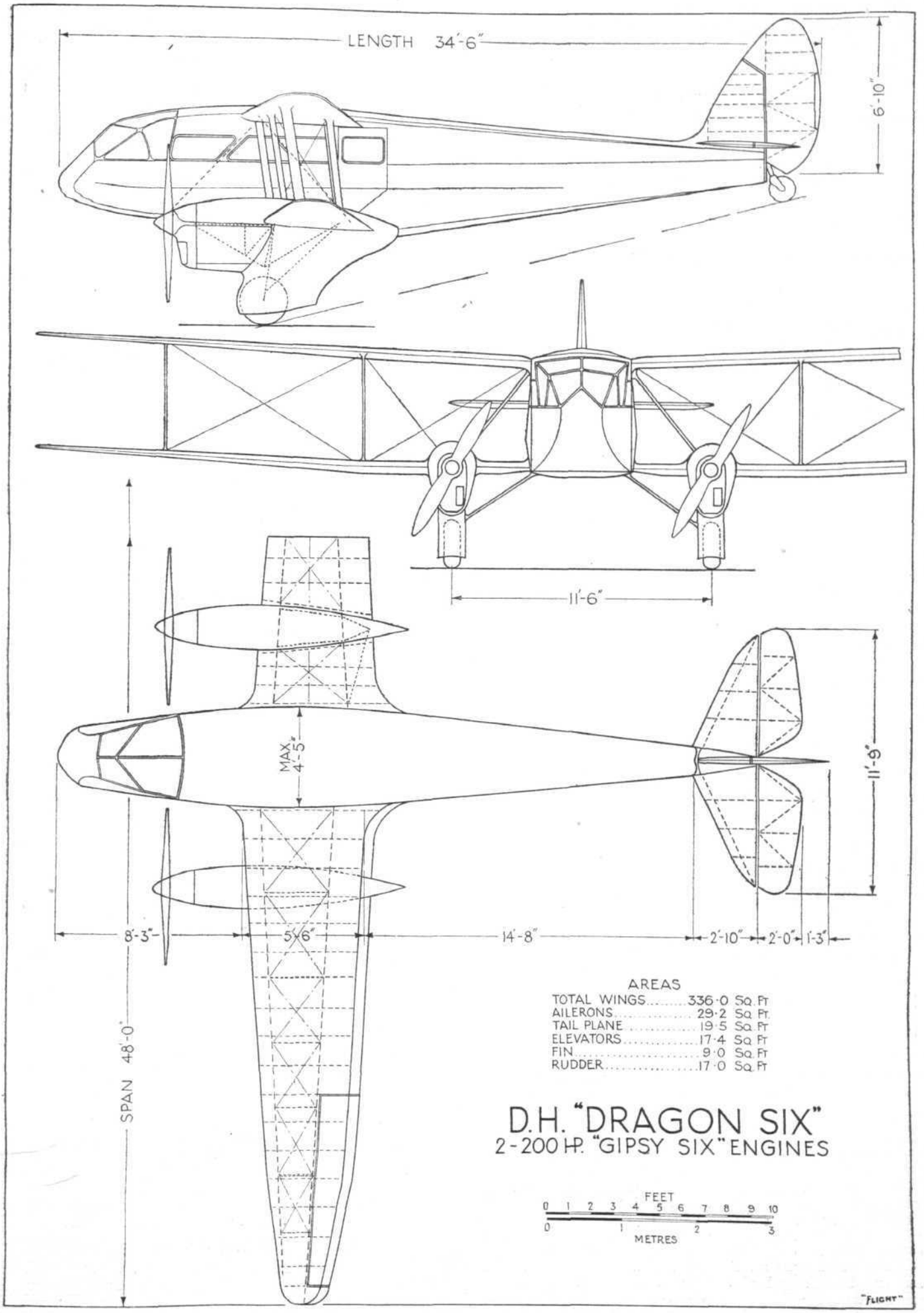
CONSTRUCTIONAL DETAILS: Showing the starboard lower wing root which carries the engine mounting, undercarriage, fuel and oil tanks.

landing gear, and each side is, of course, identical. In this centre section the front spar is a steel tube and continues from one side to the other under the floor of the fuselage. The leading edge of the wings is smoothly finished off with fabric covered plywood, and the ailerons, of which there are four, are completely covered with the same material. They are not balanced aerodynamically and are tapered to conform with the plan form of the wing. The ailerons in the top wing are operated by a push rod which is worked by a lever underneath the bottom plane, and led through the single strut between the wing tips, thereby doing away with external connecting gear to a great extent, and, of course, reducing drag considerably. All the inter-plane strut roots are carefully faired to the wing surface with light alloy "cuffs." The wing roots are similarly filleted and faired into the fuselage with sheet light alloy fairing.

The engine and landing gear on each side form separate units. From each side of the wheel axle a tube runs straight up to the front spar, and carries in it a shock-absorbing strut designed and manufactured by Aircraft Components, Ltd., of Cheltenham, or, as it is perhaps better known, a Dowty leg. These tubes are braced to the rear spar by other steel tubes. In the front of this structure the engine mounting is carried, and this follows normal de Havilland design, being a welded up mounting



WING DETAILS: On the left is the arrangement of a spar joint, also showing the attachment of one of the steel tube drag struts. On the right are rib details and the leading edge of the wing.



GENERAL ARRANGEMENT DRAWING OF
THE DE HAVILLAND "DRAGON SIX"

D.H. "DRAGON SIX"

TWO "GIPSY SIX" ENGINES GIVING 205 H.P. EACH AT 2,350 R.P.M.

DIMENSIONS

	ft.	in.	*m*
Span of wing	48	0	(*14,63*)
Height overall	9	10	(*3,00*)
Length overall	34	6	(*10,51*)
Wheel track	11	6	(*3,50*)
Engine centres	11	6	(*3,50*)
Mean chord	4	4	(*1,32*)
Aspect ratio	11·7 to 1.		
Incidence	3 deg.		
Dihedral	3 deg.		

AREAS

	sq. ft.	*m²*
Main plane with ailerons	336	(*31,21*)
Ailerons, total	29·2	(*2,71*)
Tail plane	19·53	(*1,81*)
Elevators, two	17·4	(*1,62*)
Fin	9·0	(*0,84*)
Rudder	17·0	(*1,58*)

WEIGHTS

	lb.	*kg*
Tare weight	2,851	(*1 293,19*)
Tare weight with metal airscrews	2,894	(*1 312,70*)
Tare weight includes : bonding, engine starters, lighting, landing lights, battery.		
Disposal load	2,149	(*974,77*)
Crew	170	(*77,1*)
Fuel, 80 gall. (*363,7 l*)	600	(*272,2*)
Oil, 7 gall. (*31,8 l*)	68	(*30,8*)
	838	(*380,1*)
Balance available for : cabin furniture and lavatory (average weight 150 lb.) (*68 kg*), wireless equipment, extra fuel, pay-load	1,311	(*594,66*)
Maximum permissible weight	5,000	(*2 267,96*)

LOADINGS AND RATIOS

Wing loading	13·7 lb./sq. ft. (*66,89 kg/m²*)
Power loading	12·2 lb./h.p. (*5,53 kg/hp.*)
Ratio of gross weight to tare weight	1·75 to 1.

PERFORMANCE

	m.p.h.	*km/h*
Maximum speed at 1,000 ft. (*304,8 m*)	165	(*265,54*)
Stalling speed, full load	63	(*101,39*)
Cruising speed (85 per cent. max. speed)	140	(*225,31*)
Best climbing speed	95	(*152,89*)
Best gliding speed	85	(*136,79*)
Best gliding angle	1 in 12.	
Everling high-speed figure	25·04.	
Ratio of maximum speed to stalling speed	1 to 2·6.	
Take-off run, no wind, full load	250 yd. (*228,6 m*)	
Landing run, no wind, full load	220 yd. (*201,2 m*)	
Service ceiling	19,500 ft. (*5 943,6 m*)	
Rate of climb at sea level	845 ft./min. (*4,29 m/sec*)	
Climb to 3,000 ft. (*914,4 m*)	4 min.	
Fuel consumption 19 gall./h. (*86,4 l/h*) at cruising speed.		

of square section steel tubes. From the spars above the centre section, sloping struts of streamline section steel tube are carried up to the top of the fuselage. Behind the engine in each case is a welded aluminium fuel tank, the standard capacity being 40 gallons *(182 litres)*, and behind that again is an oil tank of similar construction. Over the whole of the engine, these tanks, and the landing gear, a very neat fairing is built up of sheet Elektron, the engine cowling itself being of the same material and merging into the fairing over the wheel very cleanly. This latter is made in two pieces, the lower forming a fairing round the wheel itself and also a mudguard, sliding up inside the skirt of the upper portion when the Dowty legs are compressed. Dunlop A.H.746 wheels are used, carrying medium pressure 8.5 in. by 10 in. Dunlop tyres and Bendix wheel brakes.

The engines are the latest pattern 200 h.p. inverted six-cylinder "Gipsy Sixes." They are fitted with Eclipse direct drive electric starters, and the B.T.H. magnetos are of the small compact kind placed on the top of the engine where they do not cause any bulges in the cowling. A revolution counter with normal flexible drive is carried on the inside of each engine mounting with its dial placed so that the pilot can see it easily from the cockpit.

The fuselage is not quite the same as the D.H.86, as the plywood is now placed outside the longerons. The general construction continues to be of spruce and plywood with vertical and diagonal spruce struts wherever necessary. Particular care has been taken to give the fuselage a good shape externally, and with this end in view sheet Elektron curved corner pieces are put over the corners outside the longerons and spruce stringers are run along the fuselage outside the plywood to carry the Titanine-doped fabric with which the fuselage is eventually covered.

The "Office"

The pilot's cockpit, which is not fitted with dual control as standard, is particularly light and airy, with an abundance of windows, giving the pilot a clear outlook in all directions. The windows in the front and at the sides are of Triplex glass, and the latter are both made to open, so that a clear view may be obtained in bad weather. Slightly behind the pilot on either side, and also right over his head, the windows are of cellon carried on a steel tube structure. The controls are normal, with a "spectacle" wheel for aileron control. The wheel operating the tail plane adjusting gear, which is of the screw type, is on the left-hand side of the pilot, below the throttle operating levers. The throttles are actuated by cables passing over large pulleys, but the altitude controls are of the Simmonds-Corsey type. The hand lever for working the Bendix brakes is on the left-hand side of the pilot's seat, and the brakes are also, of course, differentially controlled by the rudder bar in the usual de Havilland fashion. A neat hinged dashboard fills the space below the front window, and carries, besides the usual range of Smith's instruments, an electric fuel gauge made by the same firm, and a Reid & Sigrist Turn and Bank Indicator and a Fore and Aft Level. The switch box controlling the navigation lights and cabin lighting is on the bulkhead behind the pilot. A rudder bias gear is fitted, actuated by a small crank handle near the floor between the pilot's legs, and the foot-rests on the rudder bar itself are fully adjustable over a wide range. The fuel cocks are operated from the cockpit by Simmonds-Corsey controls.

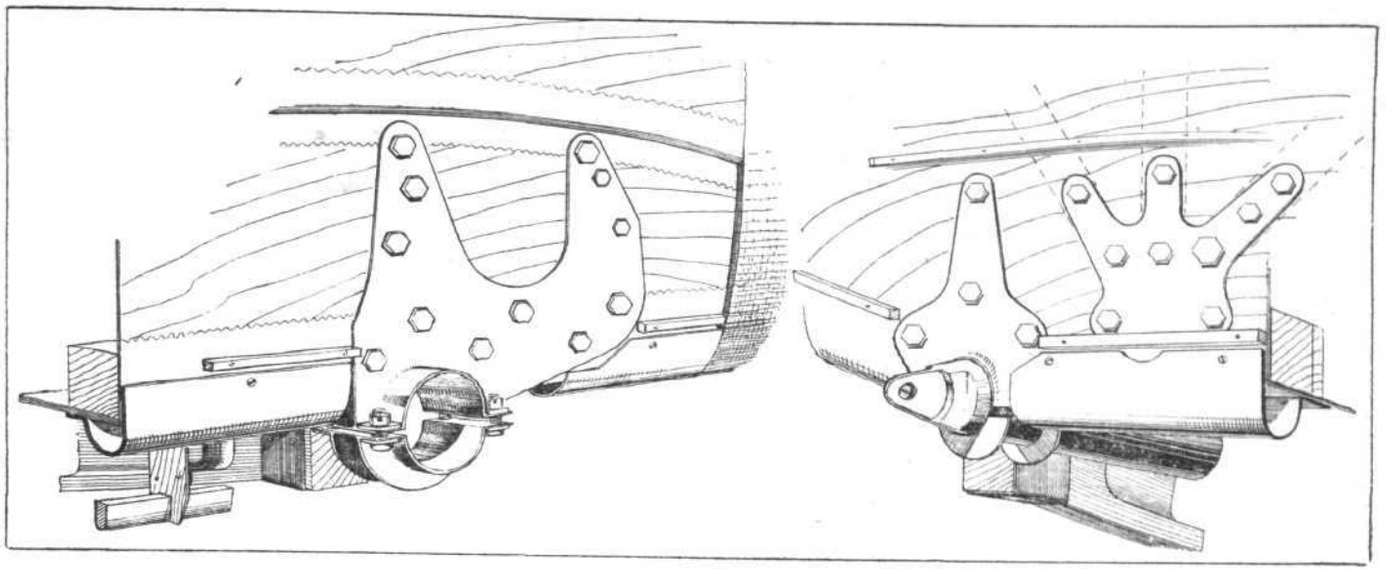
The passenger cabin can, of course, be arranged in any manner to suit individual users. The standard arrangement includes accommodation for six passengers with luggage. This first machine is tastefully upholstered in grey by L. A. Rumbold & Co., Ltd., and the tubular chairs are made by the same firm. Cellon windows extend the whole length of the cabin and are set in light alloy frames, while the space between the external plywood structure and the internal upholstery, which is necessitated by the thickness of the longerons and bracing struts, is filled, at the sides of the cabin, with Cabot quilting for sound-proofing purposes. An adequate supply of fresh air is brought into the cabin through a plated duct, placed high up on either side and fed from an inlet in the fairing of each upper wing root.

Controls

The tail units are of the distinctive de Havilland shape and spruce construction. The fin and rudder are plywood covered, and the latter carries a small metal aerodynamic balance in the same manner as that of the D.H.86, which was fully dealt with on page 172 of FLIGHT for February 22, 1934. The tail plane has a plywood leading edge, and the whole is fabric covered, while the elevators are also fabric covered. Great care has been taken with fairing in the tail units to the fuselage, and the tail plane is braced to the fin and fuselage with dual streamline wires.

The control surfaces are all worked by Tru-lay cables passing over large diameter pulleys, thus obviating any unnecessary friction. The tail wheel is of the fully castering type, carrying a 10 in. × 3 in. Dunlop tyre, and the taxying shocks are absorbed by rubber blocks in compression.

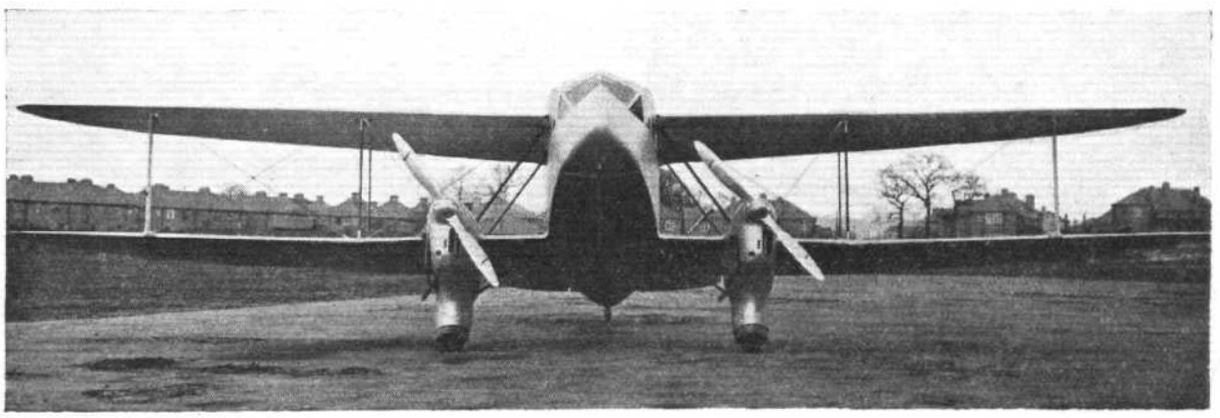
Recently we flew in the new D.H. "Dragon Six" a few minutes after having made a trip in the older type "Dragon," and had an opportunity of making an interesting comparison of the two types. The "Dragon Six"



WING ATTACHMENTS : Fittings and details of the bottom longeron showing the Elektron fairing which carries the fabric over the corner of the fuselage.

was flying "light" and carried, besides Capt. Hubert Broad, the pilot, only three passengers. The sound proofing arrangements had not then been completed and consequently the machine was somewhat noisy. When, however, it is finished, it is improbable that it will be noisier than the standard "Dragon." The wing area, seen through the windows, appears small compared with that of the earlier type, owing to the sharply tapered wings. Acceleration on the ground was considerably in advance of that of the old model, as was to be expected in view of the improved aerodynamic design and increased power. Although the engines were throttled well back on the climb, we were at 10,000 ft. in a surprisingly short time, and at this height Capt. Broad demonstrated the excellent manœuvrability of the machine.

While we were cruising at below normal power a "Leopard Moth" ("Gipsy Major"), which was looking for us above the clouds, had difficulty in catching up with us, as the cruising speed of the new machine was about 140 m.p.h. As no form of air brake is provided the gliding angle is flat and the actual landing speed is probably 4 or 5 m.p.h. higher than that of the old type. We thought the undercarriage seemed less harsh than that fitted to the standard "Dragon," although there is little cause for complaint regarding the old type of landing gear.



HEAD ON : The manner in which low profile drag has been achieved to a great extent is shown in this photograph. (FLIGHT *Photo.*)

R.Ae.S. Lecture

TO-DAY, Thursday, April 26, Dr. R. Stussel, Chief Engineer of the Deutsche Luft Hansa, will lecture before the Society on the important problem of Landing Commercial Aircraft in Fog. Dr. R. Stussel will give the experiences of the Deutsche Luft Hansa flying in bad weather, and explain the methods which are used for getting off and landing under conditions of bad weather which make it impossible for the pilot to see ahead. He gives numerous instances of the landing of pilots by instruments alone, and explains what instruments are necessary, and the lines of development which are being followed. Dr. R. Stussel also explains the "ZZ" system of control in conditions of fog. The lecture will be fully illustrated, and will be delivered at 6.30 p.m. in the Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2.

A handy manual

AUSTRALIAN pilots are particularly lucky in having Mr. Fred Haig, the Chief Aviation Officer of the Vacuum Oil Co. Pty., Ltd., of Australia, who looked after their interests. Mr. Haig's department has recently produced a concise, well written and particularly informative little booklet called "Aviation Manual" a copy of which, no doubt, accredited pilots may obtain upon application to the Vacuum Oil Co. All the ordinary phenomena of flight are clearly explained, not only in the text of the book but also by illustration, aeroplane manœuvres in particular being covered extremely lucidly by the latter method. Aircraft care and maintenance, lubrication and care of aircraft engines, navigational rules, compass compensation, meteorological information, and many other subjects about which a pilot has to be knowledgable are well dealt with, and finally, a concise guide to all the landing grounds of Australia.

ICE FORMATION

Curiously enough, it is not until relatively recently that British aircraft have suffered from the effects of ice forming on machine and airscrew. Our photographer was fortunate enough the other day to get some interesting photographs of ice deposits on a Hawker "Hart"

ALTHOUGH American aeroplanes appear to have suffered from ice formation for some time, it has not, generally speaking, been the experience of British pilots that ice was an enemy to be reckoned with. During the last year or two, however, cases have occurred where the formation of ice has caused serious trouble. Machines have had to come down almost to ground level before the ice cleared, and for a commercial aeroplane on its route this is not an experience to which the pilot would willingly treat his passengers. There have even been one or two cases in which crashes have been thought to be due to ice formation.

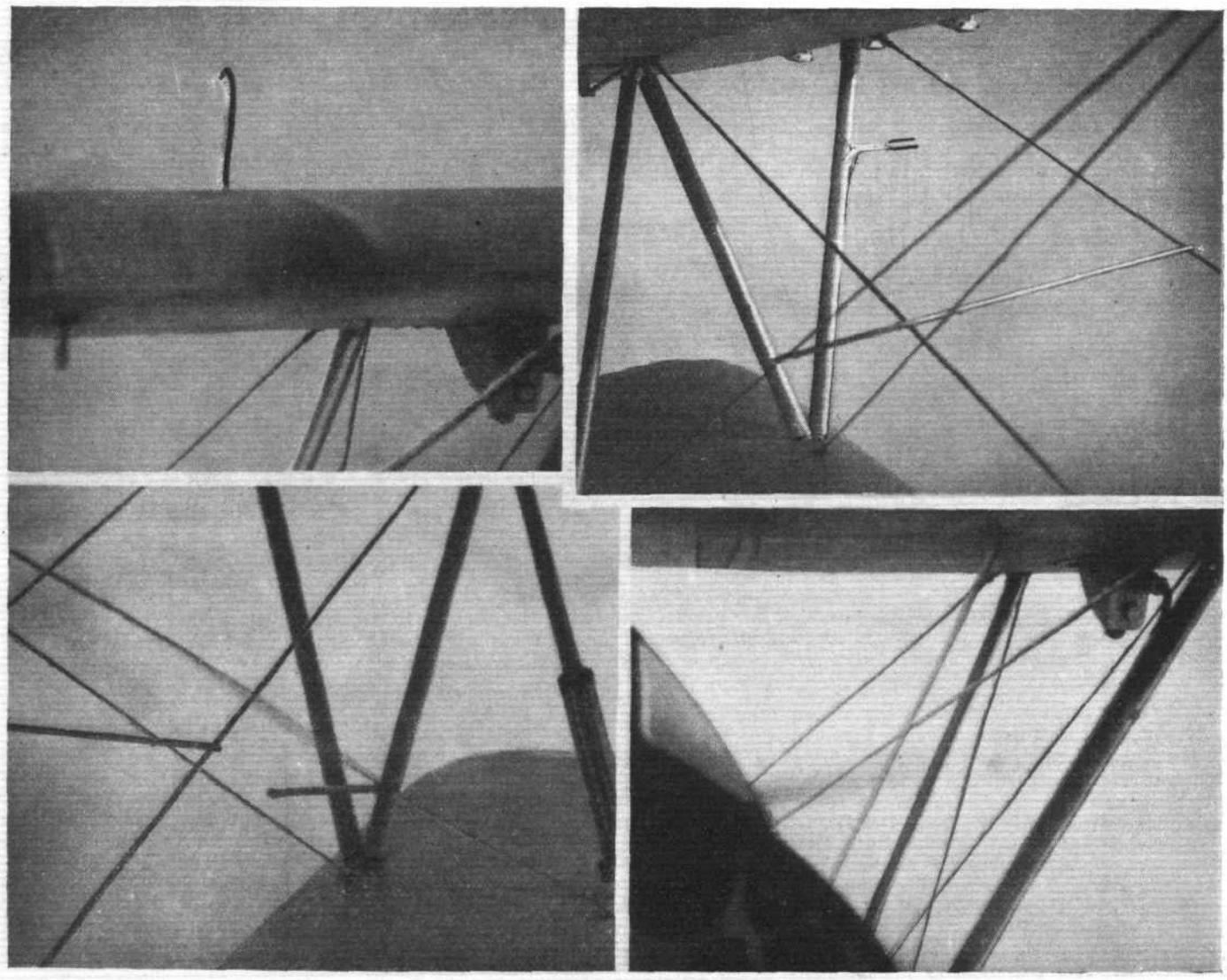
Conditions favourable for the formation of ice are a temperature close to freezing point, and air with a considerable moisture content. The ice seems to begin to build up at or near leading edges of wings, struts, wires and airscrews, and in time the ice formation will, if allowed to continue, reach considerable proportions, and may cause a breakdown of the smooth airflow, with the possibility that control is lost, or at least reduced.

Various remedies have been sought, but at present the most promising seems to be the introduction, at places where ice is most likely to form, of glycerine. The problem is difficult, but there is little doubt that in time a solution will be found.

A short time ago our chief photographer was making a flight in a Hawker "Hart" with Flt. Lt. Bulman, Hawker's chief test pilot. Conditions were suitable for ice formation, and it was decided to fly on and see what would happen. Some of the results are shown in the photographs.

The pitot tube and the vent pipe from the petrol tank soon covered over with ice. So did wing leading edges and interplane struts and wires. But most serious was, perhaps, the formation of ice on the airscrew, which caused very bad vibration. So bad in fact that further flying had to be abandoned and a descent made.

A curious phenomenon was the breaking of the steadying tube between the wing bracing wires. When one of the wires became coated with ice, it started to vibrate violently, and this vibration broke the tube, as may be seen in one of the photographs.



ICE BOUND : In the upper left-hand picture is the petrol vent pipe, and on the right the pitot head. The broken steadying tube is shown in the lower left-hand photograph, while on the right is the ice coated centre-section and its struts and wires. (FLIGHT *Photos.*)

The AIRCRAFT ENGINEER

"FLIGHT" ENGINEERING SECTION

Edited by C. M. POULSEN

No. 99 (Volume IX No. 4) 9th Year April 26, 1934

CONTENTS

EVAPORATIVE COOLING

By R. Haley

(*Concluded from page* 24.)

Experimental

Experiments were carried out at the R.A.E. in 1927 on a Bristol Fighter to ascertain the advantages of Evaporative Cooling. The aircraft was fitted with a triangular honeycomb radiator, placed above the top centre section. Fig. IV is a diagram of the system employed which had no steam separator but relied on the bottom of the condenser to act in this capacity. It was found in this test that the steam separated from the circulating water too late in the system and it was suggested that a separator fitted close to the exit from the water jacket would have prevented a large percentage of the water being carried up with the steam. In wing surface condensers a large proportion of water in the steam becomes a positive danger as there would be an excess of weight in the condensers as well as retaining a large quantity of water, thereby depleting the amount required round the cylinder jackets.

To complete the experiments the same machine was used but with wing surface condensers. These condensers were subjected to a test of 1½ lb. per sq. in. both internal and external; relief valves were fitted to blow off at 1 lb. per sq. in. The first flight tests were made with all four condensers in operation, *i.e.*, top and bottom wings, and a loss of water slightly under 1 pint for a climb of 5,000 ft. and a cruising flight of two hours' duration was registered.

In a paper read before the I.A.E. in 1930 by Capt. Andrew Swan, B.Sc., some of the concluding remarks might be of interest:—

"The leading edge condenser occupying the wing in front of the main span would appear to be restricted in its application to wings of comparatively small size and of large surface per horse-power. In large wings the condensers would have a high volume surface ratio, and cooling might be adversely affected. As the upper surface of a wing has good cooling properties for a considerable portion of its chord, a condenser of low volume surface ratio could be obtained by using a double-skin construction. Where, however, the area available is definitely limited, a retractable honeycomb radiator could be introduced into the circuit to assist under conditions of peak load."

Cooling Surface

The capacity to dissipate heat from the system described depends on several factors, and it is extremely difficult to hit on a happy medium. It is well known that the amount of cooling surface required is not constant for any particular engine, but varies with the atmospheric conditions and the climb characteristics of

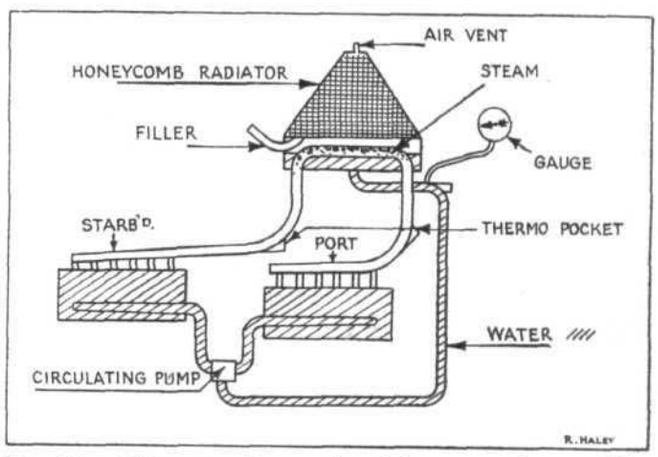


Fig. IV.: Diagram of experimental evaporative cooling system fitted on a Bristol Fighter in 1927

the aircraft. Also the heat supplied to the water jacket in the naturally aspirated engines falls with, but not at the same rate as, the power, as the altitude increases.

The capacity to dissipate heat from the condensers, however, tends to increase with the altitude when climbing at a constant I.A.S. Allowing, therefore, for the heat reservoir capacity of the water jacket, oil, and metal parts of the engine, the time of climb from G.L. to a given altitude will have a material effect on the size of the condensers, due to the fact that the machine leaves the ground with the cooling system well below boiling point. Other factors in estimating the surface required are:—(1) Change in boiling point of water with increased altitude; (2) variation in air temperature throughout the year; (3) change in cooling air temperature and density at various altitudes.

The condensers, of course, have to get rid of the "latent heat" of the steam and the quantity of steam generated is a big factor in the design. If the rise in temperature of water round the cylinder jacket is 20 deg. Fahr. the quantity of heat carried by 1 lb. of water is 20 B.T.U., whereas the quantity of heat carried by 1 lb. of steam is 966 B.T.U. It is a well-known fact that no steam is produced until the temperature of evaporation is reached, and this is controlled by the pressure. Whilst evaporation is taking place the temperature remains the same until all the water is evaporated. The heat supplied to the water after raising it to evaporative temperature until it is all converted to steam is termed the "Latent Heat" of steam.

As the heat transferred from the surface of the wing condensers to the atmosphere must pass through the boundary layer, the condition of the layer becomes of great importance and at some point between the L.E. and T.E. the laminar layer becomes turbulent and is effected by the steadiness of the air advancing on the L.E. of the wing. Hence the importance of keeping the surface of the wing condensers as clean as possible.

Having obtained the quantity of heat to be dissipated in terms of h.p. from the engine manufacturers, make a layout of the wing condenser using about 25 per cent. of the top surface and 15 per cent. of the bottom surface, making the area of the surface approximately 0.2015 d_L, where d = total profile of aerofoil surface in feet and L = length of L.E. occupied in feet. These proportions will be governed largely by the design of the wing and wing tips, and must be tried out. To obtain the amount of cooling from the condenser let C = total cooling in h.p., d = total profile of aerofoil section in ft., L = length of L.E. occupied in feet, v = speed of oncoming air in feet per sec.; σ and μ are the density and viscosity of the air, expressed relative to I.C.A.N. ground level values, M = the mean temperature difference in deg. C., k_L = a function of the lift coefficient.

Then $$C = \frac{ML}{10^5}(1{\cdot}33k_L^2 + 12{\cdot}27k_L + 17{\cdot}54)\,(vd)^{\cdot 74}\,\mu^{\cdot 26}$$

Example:—An aeroplane with a wing section of 8 ft. chord, giving approximately a perimeter of 16.32 ft., is required for tropical summer conditions with a mean steam pressure of ½ lb./sq. in. within the wing condenser. The total length of condenser is 40 ft. and cooling surface is of "standard properties," *i.e.*, 25.1 per cent. of top surface and 15.2 per cent. bottom surface.

What h.p. can be dissipated at an altitude of 9,000 ft. and an air speed of 150 ft./sec. with a k_L of 0.3?

$$C = \frac{67{\cdot}6 \times 40}{10^5}(21{\cdot}34) + (150 \times {\cdot}692 \times 16{\cdot}32) + (1{\cdot}022)^{\cdot 26} = 142{\cdot}3 \text{ h.p.}$$

see Tables I and II R & M 1481

On climb there is an additional amount of heat to be dissipated, depending upon the rate at which the boiling point, corresponding to the pressure, is falling as the altitude increases. At 5,000 ft. the boiling point of water falls about 1.05 deg. C. in a 1,000 ft. of pressure altitude, so that with a steam cooling system a 1,000 ft. ascent has the same effect as a supply of sensible heat sufficient to raise the cooling water and its associated metal 1.05 deg. C. If We is the water equivalent of the system which must be maintained at the boiling point corresponding to the pressure, and "R" the rate of climb in feet per minute, then this additional cooling is about $\frac{1{\cdot}05}{1{,}000} \times \frac{We\,R}{23{\cdot}6}$ horse-power.

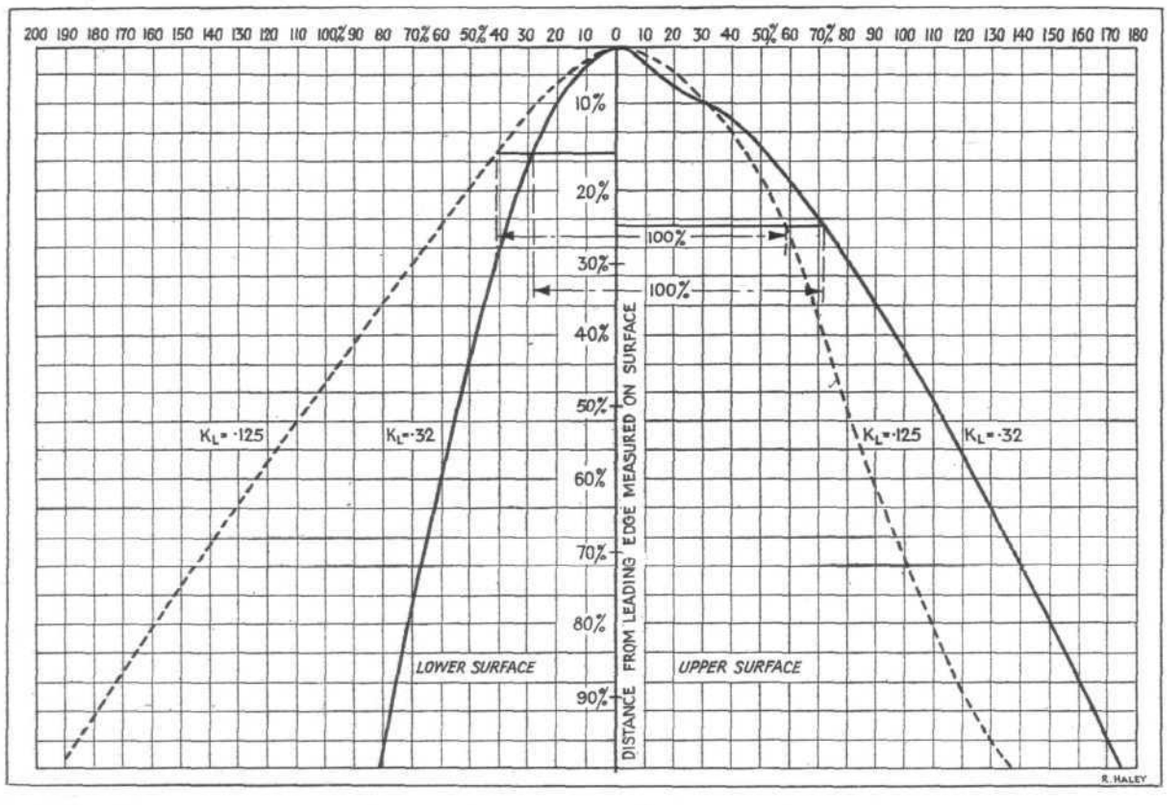


Fig. VI.: On left of datum line, cooling from lower surface compared with total cooling of standard surface at the same k_L. On right of datum line, cooling from upper surface compared with total cooling of standard surface at same k_L.

Two distributions of emissivity taken from results studied in R. & M. 1163 are illustrated in Fig. VI, one referring to a k_L value of 0.125 taken as typical for level flight and the other with a k_L of 0.32 as typical of climb conditions. The abscissæ are distances measured from the L.E. over the profile towards the T.E. expressed as percentage of the profile distance

between these edges. The ordinates at any point gives the total cooling obtainable out of a surface extending from the L.E. up to that point. The scale is such that the cooling obtainable from the standard surface is represented by a total ordinate of 100. Thus, for the climb case, from 25.1 per cent. of the upper surface the cooling is 70.8 units, and from 15.2 per cent. of the lower surface it is 29.2 units. Such a scale makes the calculation of the actual surface from the standard surface an easy matter. Suppose the standard surface required in a particular condition of climb to be 110 sq. ft., while the standard area available on the aircraft is only 88 sq. ft., then the cooling required on the wing surface per unit length of the L.E. will be 125 per cent. that of the standard. From the curve, one combination which will meet this requirement is 41 per cent. of the upper surface and 15.2 per cent. of the lower surface measured from the L.E. The actual area then used will be:

$$\frac{41 + 15{\cdot}2}{25{\cdot}1 + 15{\cdot}2} \times 88 \text{ or } 122{\cdot}8 \text{ sq. ft.}$$

Of course, there are infinite numbers of positions of the profile which will combine to give the required effect, and the position chosen will be largely governed by the position of the front spar relative to the L.E. and the angle of climb which governs the angle of the drain pipe from the T.E. of the condenser.

Retractable Condenser

Experiments carried out at R.A.E. show that the triangular honeycomb radiator is more efficient than the square type. Readers who are familiar with marine condensers will have noticed that the steam is introduced into a large opening at the top of the condenser, and also at the hottest point of the condenser. We may see something very similar in aircraft in the near future, complete with air pump, etc.

To return to the present model, if steam is supplied above the heat dissipating capacity of the radiator some must flow out of the air vent and be lost, see Fig. III. The efficiency of the radiator partly depends on its capacity to adjust its heat dissipation by drawing in air or expelling air as the heat supply is altered. The design of the radiator should be such that no air pockets can be formed, preventing the easy flow of steam. The steam should be introduced at as low a point as possible with the air vent at the top of the radiator, when the full efficiency of the cooling surface of the tubes will be made use of. Here it would be as well to mention that the tubes are of the standard hexagonal ended type either 360 mm. or 400 mm. long by 7 mm. or 10 mm. dia., according to the design in hand. The working weight of the condenser must include the film of water round the tubes and is in the range of 0.38 lb. to 0.43 lb.

Tilting the radiator relative to the horizontal plane of flight has no decided advantage, owing to increased drag, but tapering the tubes has a decided advantage. Arrangements can be made in the design for the condensate to be collected at the lowest point of the sump. There is a definite increase in efficiency when the steam is introduced at the front end of the radiator.

The problem of selecting a criterion for the cooling efficiency of a radiator is an intricate one. It is necessary to compare, in given temperature conditions, the rate of heat dissipation for the radiator with the maximum rate of heat dissipation it is capable of, *i.e.*, at the boiling point of the liquid, when the maximum demand is made of it. Maximum demand implies that the engine is at full throttle and that the air velocity through the radiator is a minimum at maximum radiator exposure. A practical example to maximum demand is obtained in flight at maximum rate of climb. This condition makes it difficult to measure steady heat conditions, since the atmospheric conditions and the factors governing the flow of heat are continually changing.

Assuming that the heat entering the radiator per second is a constant fraction of the b.h.p. (1 b.h.p. = 2,545 B.T.U./hr.) at a height "h" (in a standard atmosphere); let ρ and σ be the relative pressure and density respectively, A the air temperature, B the boiling point of the liquid in the radiator, M the mean radiator temperature, V the forward velocity. The heat to be dissipated per second is proportional to ρ, and the heat discharge from the radiator per second is proportional to $(M\text{-}A)\sigma V$; and in a climb "V" is proportional to a power of σ between o and $\frac{1}{2}$, so that the rate of heat dissipation is proportional to $(M\text{-}A)\sigma^{n}$. The maximum rate of heat dissipation possible is $(B\text{-}A)\sigma^{n}$.

To enable the pilot to know when the radiator is too far within the fairing, *i.e.*, when the radiator is not condensing all the steam received from the wing condensers, a warning device is fitted to the bottom of the air vent, which, when steam passes to atmosphere, makes electrical contact with a small lamp fitted on the instrument board, giving the pilot warning that steam is being lost. The writer can foresee the day when some electrical device will operate the radiator in and out, functioning by the emission of steam through the air vent. This air vent must protrude clear of the fairing when the radiator is in the full-up position. In this position also, the sump must be in the slipstream.

Header Tanks

The design of header tank is largely in the hands of the engine manufacturers, who should be consulted before any drawings are issued to the shops. As this unit

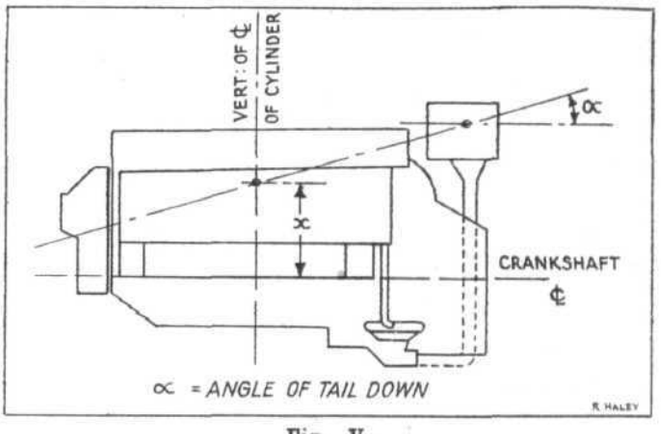


Fig. V.

is still in its experimental stages, it would be useless to describe any particular type in this article. The material used in construction can be either aluminium with welded ends, or Dural with riveted ends. As most of the internal piping is of intricate shape, they can be made up in aluminium and welded.

Certain features are common to all header tanks, *viz.*, the sump must have baffles to prevent the water swirling, a pressure gauge, temperature thermometer, and filler neck must be fitted; also a fitting to accommodate the low water level warning device. This is operated on the same principle as the steam loss device fitted to the retractable radiator.

On certain type of aircraft it is necessary to fit a valve for inverted flight to prevent the water from passing up the steam pipe to the wing condensers. To fix the position of the filler neck it is necessary to find out the cylinder jacket volume, plus the volume of all the piping containing cooling water, *i.e.*, the main feed pipe from the tank sump to engine pump, the pipe leading from the cylinder head to tank, and any internal piping. About 50 per cent. of the tank's total capacity

is air space, and the volume of internal steam pipes must be deducted from the tank capacity before fixing the total water capacity of the tank.

A typical example of the method of arriving at the water level in the header tank is shown in Fig. V. The position of this level naturally governs the position of the lip of the filler neck when the aircraft is tail down. From a graph provided by the engine manufacturers one can plot the intersection of the water level line with the centre line of engine, which, when produced through the header tank, fixes the level relative to the vertical.

AN INVESTIGATION INTO THE VARIATION OF ENGINE POWER WITH HEIGHT

By W. R. ANDREWS, A.F.R.Ae.S.*

DURING the last few years much investigation has been done regarding the best basis of reduction to standard of aircraft performance. The outcome has been the adoption of a basis half-way between the pure density and the pure pressure. The question of the actual variation of engine power with height has become of secondary consideration. Messrs. Coales & Lingard (Ref. 1) have discussed the question at great length from the analysis of a number of full scale results. The final presentation of their results does not make extrapolation possible, and over the range of heights considered gives no indication of the variation of engine power at other than standard temperatures.

Any empirical relationship for the power factor must cover extrapolation to great heights, as well as tropical and arctic conditions.

In an endeavour to produce a rational basis of reduction Diehl (Ref. 2) introduced a power factor based on the results of bench tests of an aero engine in the N.A.C.A. altitude chamber. These tests (Ref. 3) were made at varying temperatures and constant pressure, separate tests being made at three or four pressures. Indicated mean pressures only are recorded in the report but from data, probably not published. Diehl deduced the following relationship :—

$$\frac{\text{B.H.P.}}{\text{B.H.P.}} = P^{1\cdot15}\ T^{-\cdot5} \quad \ldots\ldots\ldots\ldots \quad (1)$$

where P = Relative pressure compared with standard G.L. pressure d 29·92 in. Hg.

T = Relative absolute temperature compared with G.L. standard of 288° C. absolute.

Such a formula as 1 gives excellent results at low height and can be expressed in the form

$$\text{Power factor} = f\,(P^{\cdot565}\ \sigma\ 0^{\cdot435}) \quad \ldots\ldots\ldots \quad (2)$$

The power of an engine is rarely proportional to R.P.M., but assuming this to be the case, then equation (2) expresses the basis of reduction of flight test data to standard conditions.

This is in close agreement with the findings of Hutchinson and Finn (Ref. 4), who found the weighed mean law for the correction for $N\sqrt{\sigma}$ to be

$$\text{Power factor} = f\,(P^{\cdot58}\ \sigma^{\cdot42}) \quad \ldots\ldots\ldots \quad (3)$$

It must be remembered, however, that the above comparison is only possible on the assumption that B.H.P. is proportional to R.P.M.

The conclusions arrived at in the tests carried out by the N.A.C.A. in the altitude test chamber on an engine at different temperatures and pressures were that the I.M.E.P. was proportional to (*a*) the absolute pressure and (*b*) the reciprocal of the square root of the absolute temperature. The tests were only intended to supply information as to the correction necessary to engine bench test data for reduction to standard conditions, which in general would be covered by temperature variations of ± 20° C. The tests, however, were carried out for a range of ± 30° C., so that all practical variations of temperature near the ground are well covered.

In the case of an aircraft the temperature variation will be much more than that covered by the N.A.C.A. tests. The standard height corresponding to − 20° is just under 17,500 ft., but in winter this temperature might easily be recorded at 10,000 ft.

A careful examination of the curves of I.M.E.P. at constant pressure from the N.A.C.A. report shows that almost in every case where full throttle was used the I.M.E.P. at − 20° was less than that indicated by the curve of the reciprocal of the relative absolute temperature. With the engine in the throttled condition the fall off is not so apparent, but since we are only concerned with the full throttle performance of the engine this fall off in power at low temperatures should be taken into account.

A similar fall off in power at the highest temperatures will also be noticed on these curves, but not quite so consistently as at the lowest temperatures. The inference to be drawn from these results is that there is a linear variation of I.M.E.P. with temperature at constant pressure.

The alternative relationships for the variation of I.M.E.P. with temperature and pressure can be expressed as :—

$$\frac{\text{I.M.E.P.}}{\text{I.M.E.P.}_0} = \frac{P}{\sqrt{T}} \quad \ldots\ldots\ldots\ldots \quad (4)$$

or

$$\frac{\text{I.M.E.P.}}{\text{I.M.E.P.}_0} = P\ (1\cdot5 - 0\cdot5\ T) \quad \ldots\ldots\ldots \quad (5)$$

where I.M.E.P. is in non-standard conditions

I.M.E.P.$_0$ is in standard conditions of temperature (15° C.) and pressure (29·92″ Hg.).

Both these alternatives will be used in conjunction with the expressions which follow in an attempt to determine the best form of the power factor. An attempt will also be made to illustrate the difference these alternatives make in the reduction of flight test data to standard.

As stated previously, equation (1) will only be an approximation at low heights as its very nature suggests a power output at infinitesimal pressures. Obviously, at some fairly low pressure, the whole of the energy of the engine is absorbed in overcoming the internal friction of the moving parts. So far as the standard atmosphere goes it will be found that equation (1) is almost identical with $P^{1\cdot05}$ at heights at any rate up to 20,000 ft.

It is obvious that if a power factor is to be capable of extrapolation in all directions it must include some factor to cover the internal losses of the engine and also make some allowance for the variation of these losses themselves with varying atmospheric conditions. In this connection there is a scarcity of data. It is only by comparisons between indicated and brake power under varying pressures and temperatures that reliable information can be obtained for use in the determination of the power factor.

The nearest approach to the required data is supplied by tests made to determine the motoring losses of a single cylinder Benz engine (Ref. 5) under varying atmospheric pressures. The results are expressed in terms of the density of the air in the cylinder at the B.D.C., *i.e.*, at the commencement of the compression stroke. It is pointed out in the report that carbonisation of the lubricating oil can materially modify the internal losses to as much as 40% of those determined by motoring tests. The results do seem to indicate that at constant R.P.M. the motoring losses can be expressed as a constant plus a linear function of the charge weight at B.D.C. Unfortunately, these tests also indicate that the loss in M.E.P. due to charge density is also proportional to R.P.M. This fall off in M.E.P. can then be expressed as

$$\text{I.M.E.P.} - \text{B.M.E.P.} = a + b\,N\,\sigma_1 \quad \ldots\ldots\ldots \quad (6)$$

where N = R.P.M.

and σ_1 = Density at B.D.C.

Assuming that the I.M.E.P. will be proportional to the charge weight it follows that σ_1 will bear the same relationship to the outside air as does the I.M.E.P., so that 6 can be rewritten in the form

$$\text{I.M.E.P.} - \text{B.M.E.P.} = a + b\,N\,\frac{P}{\sqrt{N}} \quad \ldots\ldots\ldots \quad (7)$$

* Mr. Andrews is on the Technical Staff of A. V. Roe & Co., Ltd.

or its alternative form

$$\text{I.M.E.P.} - \text{B.M.E.P.} = a + b\,N\,P\,(1{\cdot}5 - 0{\cdot}5\,T)$$

where a and b are constants.

From which it follows

$$\Delta\,\text{H.P.} = N\left(a_1 + b_1\,N\,\frac{P}{\sqrt{T}}\right)\phi \quad . \quad . \quad . \quad . \quad . \quad . \quad (8)$$

Over quite a large range of R.P.M. the I.M.E.P. may be taken as constant so that the power factor can be expressed as :—

$$\rho_e = \frac{\text{B.H.P.}}{\text{B.H.P.}_o} = \frac{\text{N.I.M.E.P.}\,\phi - N\left(a_1 + b_1\,N\,\frac{P}{\sqrt{T}}\right)\phi}{\text{N.I.M.E.P.}_o\,\phi - N\,(a_1 + b_1\,N)\,\phi}$$

Since $$\frac{\text{I.M.E.P.}}{\text{I.M.E.P.}_o} = \frac{P}{\sqrt{T}}$$

then $$\rho_e = \frac{\frac{P}{\sqrt{T}} - \left(a_2 + b_2 N\,\frac{P}{\sqrt{T}}\right)}{1 - a_2 - b_2\,N} \quad . \quad . \quad . \quad . \quad . \quad (9)$$

Since the power factor is a function of R.P.M. it follows that the factor obtained from climb data must be different from that obtained from the level speeds. However, the more important quantity is the climb and by a lucky coincidence it is unusual for the R.P.M. on climb for an unsupercharged engine to vary more than 1 per cent. per 5,000 ft., so th at there will be no very great loss of accuracy in omitting the R.P.M. from the equation and re-writing in the form.

$$\rho = \frac{\frac{P}{\sqrt{T}} - d - g\,\frac{P}{\sqrt{T}}}{1 - d - g}$$

$$= \frac{P/\sqrt{T}\,(1 - g) - d}{1 - d - g}$$

$$= P/\sqrt{T}\,(K - h) - f$$

Since ρ_e must equal 1·0 when $P/\sqrt{T} = 1{\cdot}0$

then $\underline{K = f + h + 1}$

so that finally

$$\rho_e = P/\sqrt{T}\,(f + 1) - f \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (10)$$

or in the alternative form

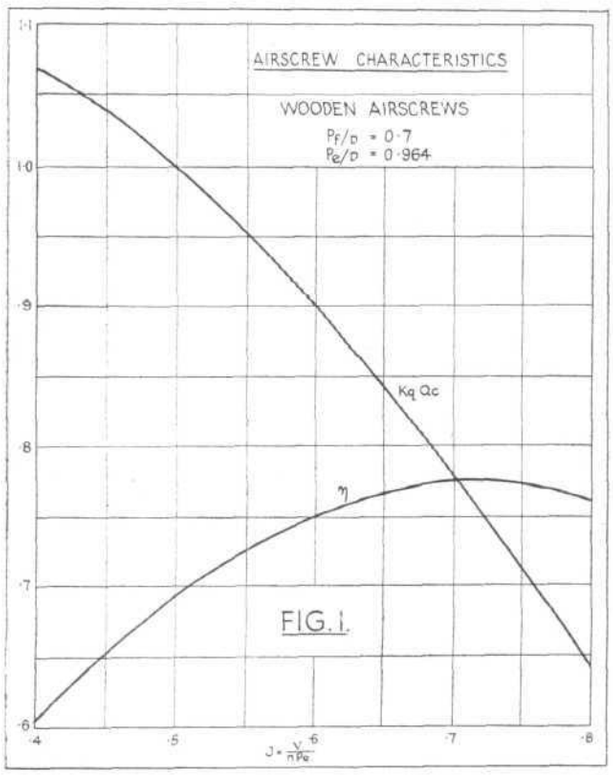
$$\rho_e = P\,(1{\cdot}5 - 0{\cdot}5\,T)\,(f_1 + 1) - f_1$$

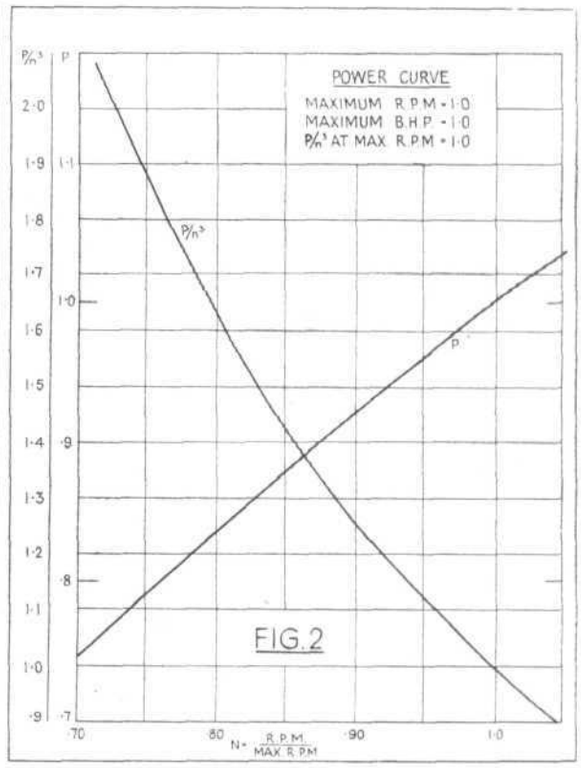
If now the assumption is made that the power factor given in Fig. 6 of R. & M. 1141 is correct at about 12,500 ft., then $f = 0{\cdot}0731$ and the following Table shows the comparison between the values calculated by 10 and those from R. & M. 1141. :—

Table 1

Standard Height, feet.	P $= p'/p_o$	T $= T'/T_o$	Power factor $= \rho_e$ $1{\cdot}0731\frac{P}{\sqrt{T}} - 0{\cdot}0731$	Power factor $= \rho_e$ From Fig. 6, R. & M.1141 (mean values)
0	1·0	1·0	1·0	1·0
5,000	0·8320	0·9656	0·8353	0·838
10,000	0·6876	0·9312	0·6912	0·693
15,000	0·5642	0·8968	0·5659	0·567
20,000	0·4594	0·6824	0·4575	0·454
25,000	0·3709	0·828	0·3639	0·335

The agreement between the two values is really no better than would be expected considering that the value of f was chosen to make equation (9) agree with the observed values at roughly 12,500 ft.





Any form of power law must give a method of reduction in keeping with that obtained from the analysis of many tests. It is suggested that to test this a hypothetical engine and airscrew be taken and the R.P.M. at different heights and temperatures calculated. The results so obtained can then be compared with those of Flight Trials.

It has been shown (Ref. 4) that the best method of reduction of flight test results to standard is nearly the half pressure half density method.

If it is possible to obtain a power factor which agrees with the findings of reference 1 and gives a basis of reduction of approximately ($p^{\frac{1}{2}}$ $a^{\frac{1}{2}}$), then by virtue of the allowance for internal losses extrapolation can be made with greater confidence than by any of the existing methods which make no allowance for engine friction.

For the purpose of determining the basis of reduction an airscrew of the following characteristics has been chosen :—

$P_{f/D}$ = Face pitch/diameter = 0·7

$P_{e/D}$ = Experimental mean pitch/dia. = 0·964

$$\text{A.S.I.} = V\sqrt{\sigma} = \frac{J.N\sqrt{\sigma}}{0\cdot725} \quad \ldots\ldots\ldots \quad (11)$$

where $J = \dfrac{V}{nP_e}$

N = R.P.M. ratio

n = R.P.S. ratio = N

$$P/_n3 = \frac{K_qQ_c}{0\cdot739}\frac{\sqrt{\sigma}}{\rho_e} \quad \ldots\ldots\ldots\ldots \quad (12)$$

$$K_q = \frac{36900\,P}{P\,n3\,D5}$$

$$Q_c = \frac{1}{K_q} \text{ at } J = 0\cdot5$$

where P = G.L. Power at "n" r.p.s.

The values of the generalised torque coefficient $KqQc$ are plotted in Fig. 1.

Since we are assuming that the power factor does not vary with R.P.M., it is only necessary to determine the values of $N\sqrt{\sigma}$ for a constant value of $\dfrac{V}{n}$ or what is the same thing at constant J.

Choosing $J = 0\cdot6$ then $K_q\,Q_c = 0\cdot901$ from which it follows by substitution in 12 that

$$\frac{P}{n^3} = 1\cdot219\,\frac{\sigma}{\rho_e} \quad \ldots\ldots\ldots\ldots \quad (13)$$

P/n^3 always corresponding to ground level conditions. By plotting P/n^3 against N we can read off the value of N corresponding to any value of P/n^3 and so calculate the appropriate value of $N\sqrt{\sigma}$. See Fig. 2.

Since $\dfrac{V\sqrt{\sigma}}{N\sqrt{\sigma}}$ is constant for any value of σ by virtue of equation (11), it follows that by plotting the $N\sqrt{\sigma}$ *for each height* in the standard atmosphere at the corresponding height a curve is obtained from which the corresponding standard height can be read for any value of $N\sqrt{\sigma}$ determined from non-standard conditions.

The atmospheric conditions chosen for the investigation are (*a*) Standard Temperature, (*b*) Standard Temperature + 30°. (*c*) Standard Temperature − 30°. The calculated values for the three atmospheres are given in Table 2.

TABLE 2

$$\rho_e = 1\cdot0731\,\frac{P}{\sqrt{T}} - 0\cdot0731$$

Height H. feet	σ	ρ_e	$\sqrt{\sigma}$	$\dfrac{\sigma}{\rho_e}$	$\rho_e\sqrt{\sigma}$
Standard Temperature					
0 ...	1·0	1·0	1·0	1·0	1·0
5,000 ...	0·8616	0·8353	0·9282	1·031	0·7755
10,000 ...	0·7384	0·6912	0·8593	1·068	0·594
15,000 ...	0·6291	0·5659	0·7932	1·112	0·4485
20,000 ...	0·5327	0·4575	0·7298	1·165	0·334
25,000 ...	0·4480	0·3639	0·6693	1·231	0·2436
30,000 ...	0·374	0·2841	0·6115	1·317	0·1738
Standard Temperature + 30°					
0 ...	0·9055	0·9474	0·9516	0·956	0·9015
5,000 ...	0·7775	0·7896	0·8818	0·985	0·6960
10,000 ...	0·6640	0·6518	0·8149	1·019	0·5310
15,000 ...	0·5635	0·5321	0·7507	1·059	0·3995
20,000 ...	0·4754	0·4281	0·6895	1·110	0·2954
25,000 ...	0·3980	0·3390	0·6311	1·174	0·2140
30,000 ...	0·3306	0·2628	0·5750	1·258	0·1454
Standard Temperature − 30°					
0 ...	1·116	1·0611	1·0565	1·052	1·1115
5,000 ...	0·9655	0·8884	0·9826	1·0870	0·8575
10,000 ...	0·8315	0·7382	0·9129	1·127	0·6740
15,000 ...	0·712	0·6067	0·8438	1·174	0·5120
20,000 ...	0·6060	0·4924	0·7785	1·231	0·3833
25,000 ...	0·5125	0·3943	0·7159	1·300	0·2822
30,000 ...	0·4305	0·3102	0·6561	1·388	0·2035
35,000 ...	0·3590	0·2386	0·5992	1·505	0·1430

The calculations of the values of $N\sqrt{\sigma}$ and the corresponding standard heights are given in Table 3 and Fig. 3.

TABLE 3

$$\rho_e = 1\cdot0731\,\frac{P}{\sqrt{T}} - 0\cdot0731$$

Height H. feet	$\sqrt{\sigma}$	$\dfrac{\sigma}{\rho_e}$	P/n^3	$N\sqrt{\sigma}$	Equivalent Standard Height, H_E	$H_E - H_S = \Delta H$
(1) Standard Temperature						
0	1·0	1·0	1·219	0·915	—	—
5,000	0·9282	1·031	1·257	0·837	—	—
10,000	0·8593	1·068	1·303	0·7628	—	—
15,000	0·7932	1·112	1·357	0·691	—	—
20,000	0·7298	1·165	1·421	0·6225	—	—
25,000	0·6693	1·231	1·501	0·5567	—	—
30,000	0·6115	1·317	1·606	0·493	—	—
(2) Standard Temperature + 30°						
0	0·9516	0·956	1·165	0·889	1,700	+ 1,700
5,000	0·8818	0·985	1·201	0·812	6,700	+ 1,700
10,000	0·8149	1·019	1·243	0·739	11,650	1,650
15,000	0·7507	1·059	1·292	0·669	16,650	1,650
20,000	0·6895	1·110	1·354	0·601	21,600	1,600
25,000	0·6311	1·174	1·432	0·5365	26,600	1,600
30,000	0·5750	1·258	1·5345	0·4735	31,550	1,550

TABLE 3—(*continued*)

Height H. feet	$\sqrt{\sigma}$	$\frac{\sigma}{\rho_s}$	P/n^3	$N\sqrt{\sigma}$	Equivalent Standard Height H_E	$H_E - H_S = \Delta H$
(3) Standard Temperature — 30°						
0	1·0565	1·052	1·282	0·945	—	—
5,000	0·9826	1·0870	1·325	0·865	3,200	— 1,800
10,000	0·9129	1·127	1·375	0·7905	8,150	— 1,850
15,000	0·8439	1·174	1·432	0·718	13,150	— 1,850
20,000	0·7785	1·231	1·501	0·6473	18,100	— 1,900
25,000	0·7159	1·300	1·586	0·580	23,200	— 1,800
30,000	0·6561	1·388	1·693	0·516	28,200	— 1,800
35,000	0·5992	1·505	1·835	0·454	33,200	— 8,000

From the tables it will be seen that there is a small tendency for the change in equivalent height ΔH to decrease as the standard height increases, for constant temperature differences.

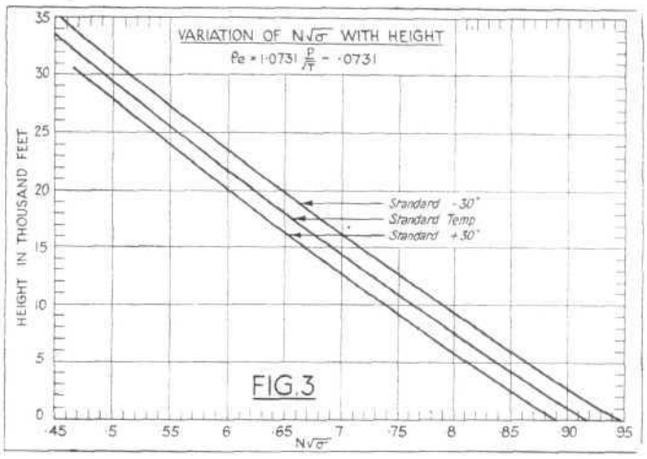


FIG.3

The average value for the ± 30° is 1,750 ft. per 30°, or 58·3 ft. per degree change from standard. This corresponds to a basis of correction of flight test data to standard of :—

$$\text{Power factor} = f(p^{0.51}\ \sigma^{0.49})$$

as compared with the weighed mean law from R. & M. 1532 of $f\ (p^{0.58}\ \sigma^{0.42})$.

REFERENCES

1.—R. & M. 1141. The determination of the horsepower height factor of engines results of type trials of aircraft. J. D. Coales and A. L. Lingard.

2.—N.A.C.A. Report No. 297. The reduction of observed airplane performance to standard conditions. Walter S. Diehl.

3.—N.A.C.A. Report No. 190. Correcting horsepower measurements to a standard temperature. Stanwood W. Sparrow.

4.—R. & M. 1532. The best basis of aircraft performance reduction. J. L. Hutchinson, B.A., and E. Finn, B.Sc.

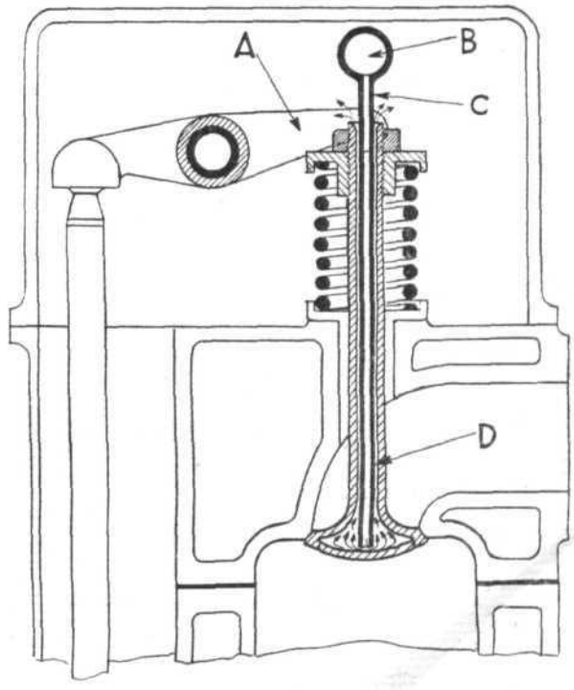
(To be continued.)

OIL-COOLED EXHAUST VALVES

Salt-filled exhaust valves have been used extensively in aero engines, more particularly in the United States of America, but oil-cooled valves are something of a novelty as far as aero engine design is concerned. A British inventor, Mr. R. C. Cross, of Bath, Somerset, has been experimenting with oil-cooled valves on a car engine, and has obtained promising results. It goes without saying that the conditions to be faced by the valves of an aero engine are a good deal more severe in many ways than those to which the average car engine valves are subjected, but the inventor does not expect any serious difficulty in applying the system to aero engines. It might be mentioned incidentally that Mr. Cross is also the inventor and patentee of the Cross rotary valve, which has been fitted on motor-cycle engines, one such engine, using a 60 per cent. petrol, 40 per cent. benzol fuel mixture, having run satisfactorily at a compression pressure of approximately 300 lb./sq. in. without detonation. The B.M.E.P. reached 157 lb./sq. in. for an unsupercharged engine.

The suggested arrangement of an overhead oil-cooled valve is shown in the diagram. In the main, the arrangement is obvious. A gallery tube *B* is connected to the oil supply and has attached to it a small tube *C*, which passes through the hollow stem of the valve into the hollow valve head. Between the tube *C* and the walls of the hollow valve stem is a small annular space *D*, through which the oil returns. *A* is a double or forked valve rocker.

It will be obvious that the Cross oil-cooled valve



CROSS OIL-COOLED VALVE : A, is a double or forked rocker ; B, a gallery oil tube ; C, a small tube connecting B with valve head ; D is an annular space between tube C and inside of hollow valve stem

arrangement in the form shown in the diagram is applicable only to engines in which the overhead valve mechanism is totally enclosed. With the open type of valve gear found on many engines the oil returning from the valve head and stem would be flung out and, apart from the loss of oil, would make the aircraft behind the engine very dirty. The oil supply is, of course, intended to be taken from the general supply, and in some cases it might be necessary to fit an oil pump of slightly greater capacity than normally provided. Apart from arranging for the gallery oil pipe, it would be necessary, in converting an existing aero engine to take oil-cooled valves, to bore out the valve guides to take the larger valve stems.

It might have been feared that carbonisation of the oil inside the valve might occur and might block the passages. Experience with a car engine indicates that this does not take place, the heat transference via the quickly-flowing oil stream being so rapid that the valve never gets really hot. The temperature of the oil after passing through the valve is raised by a few degrees only.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

THE EXPERIMENTAL DETERMINATION OF PITCHING MOMENT OF AN AEROPLANE DUE TO ROTATION IN PITCH.

By A. S. Halliday, B.Sc., Ph.D., D.I.C., L. W. Bryant, B.Sc., A.R.C.Sc., and C. H. Burge. R. & M. No. 1556. (27 pages and 28 diagrams.) March 30, 1933.

All previous measurements of the damping moment of an aeroplane in pitch have been made by the method of oscillation in the wind tunnel. Unfortunately, as pointed out in R. & M. 718, this method does not determine the true value of M_q directly, but is subject to a correction due to the fact that the incidence changes during the experiment.

In consequence of the appreciable time taken by the downwash from the wings to reach the tail, the effective incidence of the tail does not at a given instant correspond to the incidence of the wings at the same instant. It has been shown in R. & M. 826 that at the incidences of normal flight the correction for this effect can be applied with some confidence, particularly if the rate of change of downwash at the tail is actually measured on the model. But the simple theory of R. & M. 718 can hardly be accepted without question for application to attitudes at the stall and above, and any method of experiment which avoids the necessity for making the correction is of great value in determining M_q at large incidences. The whirling arm provides such a method, since the incidence remains constant throughout the motion

There are large differences in the values of the derivative $K_B m_q$ at angles of incidence above the critical angle obtained by the two methods. Below the critical angle they give the same result to an average accuracy of about 10 per cent. provided the oscillation measurements are corrected for rate of change of wing downwash in accordance with the principle laid down in R. & M. 718.* In view of the uncertainty of this downwash correction it is considered that the whirling arm measurements are to be preferred for the normal flying range of incidences. For ordinary calculations of longitudinal stability it is probably sufficiently accurate to compute $K_B m_q$ from the tail forces alone making no allowance for wings and body.

The derivative Z_q for the wings may equal or considerably exceed Z for the tail. The experimental measurements of Z_q and $K_B m_q$ for a sing aerofoil agree reasonably with the theoretical values.

* R. & M. 718. The effect of the lag of downwash on the longitudinal stability of an aeroplane and on the rotary derivative M_q.—W. L. Cowley and H. Glauert

BENCH AND FLIGHT TESTS OF A ROOTS TYPE AIRCRAFT ENGINE SUPERCHARGER.

By the Staff of the Engine Experimental Department, R.A.E. Communicated by the D.S.R., Air Ministry. R. & M. No. 1558. (23 pages and 16 diagrams.) September, 1933.

The purpose of the investigation was to investigate the application of the Roots class of displacement supercharger to an aircraft engine, bench tests of a unit of this type, built to N.A.C.A. specification, were carried out to examine its performance characteristics, and subsequently flight tests were undertaken to determine the capabilities of a Lion V.S. engine fitted with this supercharger.

The bench calibration tests covered a range of rotor speeds from 2,750 r.p.m. to 3,900 r.p.m., and the necessary quantities were measured to enable the power absorbed by the supercharger and the volumetric and adiabatic efficiencies to be calculated. From this information the probable rated altitude in combination with the Lion engine was deduced.

The flight tests, which were carried out in a D.H. 9A aircraft, consisted of determinations of (1) the rated altitude on climb and in level flight; (2) the ceiling; and (3) level speeds at the rated boost pressure of the engine below the rated altitude and at the maximum obtainable boost pressure above it. During the several flights, additional observations were recorded relating to the individual performances of the aircraft, engine and supercharger.

The Roots supercharger was found to be especially suitable for engines with rated heights in the vicinity of 20,000 ft. At pressure ratios corresponding to altitudes of this order a satisfactory volumetric efficiency is maintained, and the adiabatic efficiency compares favourably with that of centrifugal superchargers. The power wasted below the rated altitude by permitting a proportion of the compressed air to escape to atmosphere is not excessive, and at ground level the total power absorbed by the supercharger can be reduced to a negligible amount.

NOTE ON THE USE OF NETWORKS TO INTRODUCE TURBULENCE INTO A WIND TUNNEL.

By E. Ower, B.Sc., A.C.G.I., and R. Warden, Ph.D., M.Eng. R. & M. No. 1559. (8 pages and 4 diagrams.) July 31, 1933.

Variations of turbulence in the wind-tunnel stream are known to have a marked effect on the results of certain types of experiments, and in attempts to study this effect wire or cord networks have been used on various occasions to introduce artificial turbulence into the tunnel. Experience at the N.P.L. suggested that this method might be unsuitable on account of the fluctuations in the time average of the velocity across a section introduced as a result of the "shadows" of the cords. Some measurements of the distribution of mean velocity and static dsestyse at different distances downstream of two networks were therefore made and the results confirmed the impression previously formed. While the transverse static pressure distribution was uniform at a distance of only 10 in. behind a network of ¼-in. cords with 1¼-in. mesh, a violently-disturbed distribution of mean velocity was observed at this distance, and even at 3 ft. behind the network the time mean of the velocity at different points in a section was found to vary by over 4 per cent.

Similar explorations were made with a streamline body in the tunnel, and it was found that the network seriously modified the velocity field near the body.

It is concluded that networks are not suitable agents to employ for any quantitative investigations of the effect of turbulence on wind-tunnel data.

THE FLOW NEAR A WING WHICH STARTS SUDDENLY FROM REST AND THEN STALLS.

Aeronautics Laboratory, Cambridge. R. & M. No. 1561. (9 pages and 12 diagrams.) August 8, 1933.

When an aerofoil is started suddenly from rest into steady motion, the fluid flow in its neighbourhood passes through a series of different forms which approach asymptotically to the steady form which occurs in the wind tunnel and in the steady flight of aeroplanes. During this transition period a vortex sheet, or surface across which the velocity of the flow is discontinuous, is shed from the trailing edge of the aerofoil and remains behind in the fluid, the strength of the discontinuity at the trailing edge falling asymptotically to zero as the steady state is approached.

H. Wagner* has advanced the hypothesis that, if the wake is infinitely thin and the trailing edge sharp, the form of the flow and the magnitude of the lift during this transition stage should be approximately calculable on the assumption that the flow everywhere outside the wake is irrotational, and that the strength of the discontinuity across the wake at the trailing edge has that unique value which is necessary to avoid infinite velocity at the edge. On this hypothesis, he calculated the distribution of vorticity in the wake and the lift at various distances from an impulsive start of an aerofoil idealised to the form of a thin flat plate of infinite span, set at an infinitesimal angle of incidence to the direction of motion.

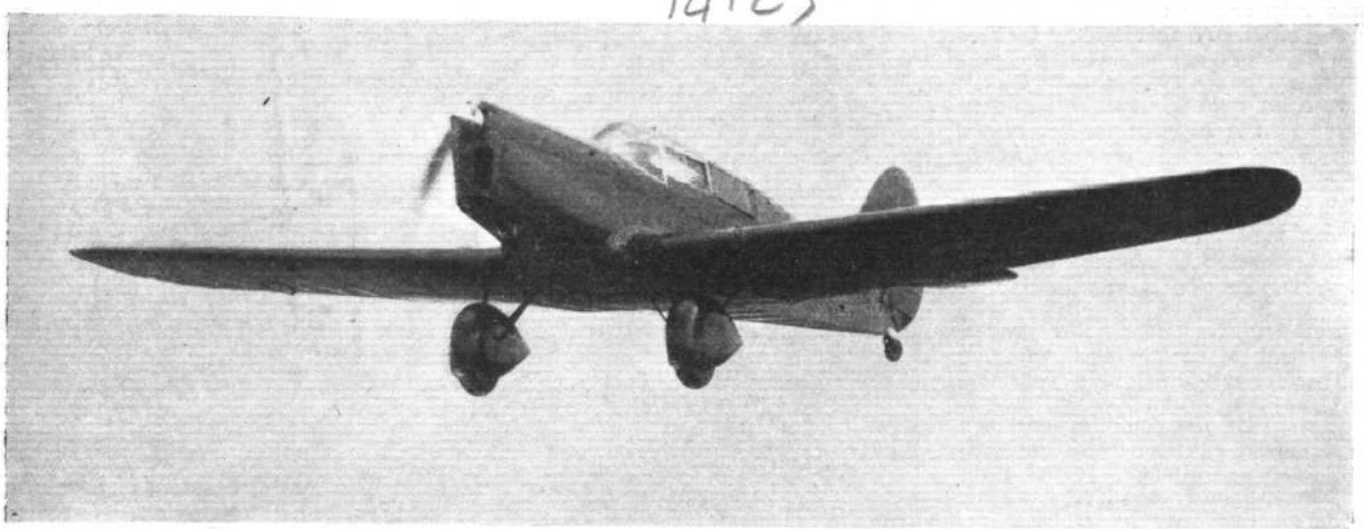
P. B. Walker,† using the same apparatus as was used for the experiments now to be discussed, photographed the two-dimensional fields of flow at various distances from a sudden start of an aerofoil of R.A.F. 30 profile set at 7·5° incidence. These photographs showed the flow changes to be substantially of the form supposed by Wagner, and measurements of the velocity fields near the aerofoil gave a curve of circulation around the profile against distance from the start, which was in remarkably close agreement with Wagner's theoretical curve, provided that, in each instance, the circulations were expressed as fractions of the circulation ultimately reached when the motion had become steady.

The first signs of the stall were observed when the distance travelled was 2·8 times the chord of the aerofoil and, at that instant, it is deduced from the measured circulations that the lift coefficient was more than one and a half times the maximum which can act steadily upon this profile at the Reynolds number ($1·3 \times 10$) of the experiment. Photographs taken after the stall had begun show the shedding of vorticity which must occur as the lift falls to the steady value.

* "The Production of Dynamic Lift on Wings." H. Wagner. Zeitschrift für Angewandte Mathematik und Mechanik. Vol. 5, No. 1, February, 1925.

† "Growth of Circulation about a Wing and an Apparatus for Measuring Fluid Motion." P. B. Walker. Reports and Memoranda No. 1402.

14123



AN IMPROVED "GULL"

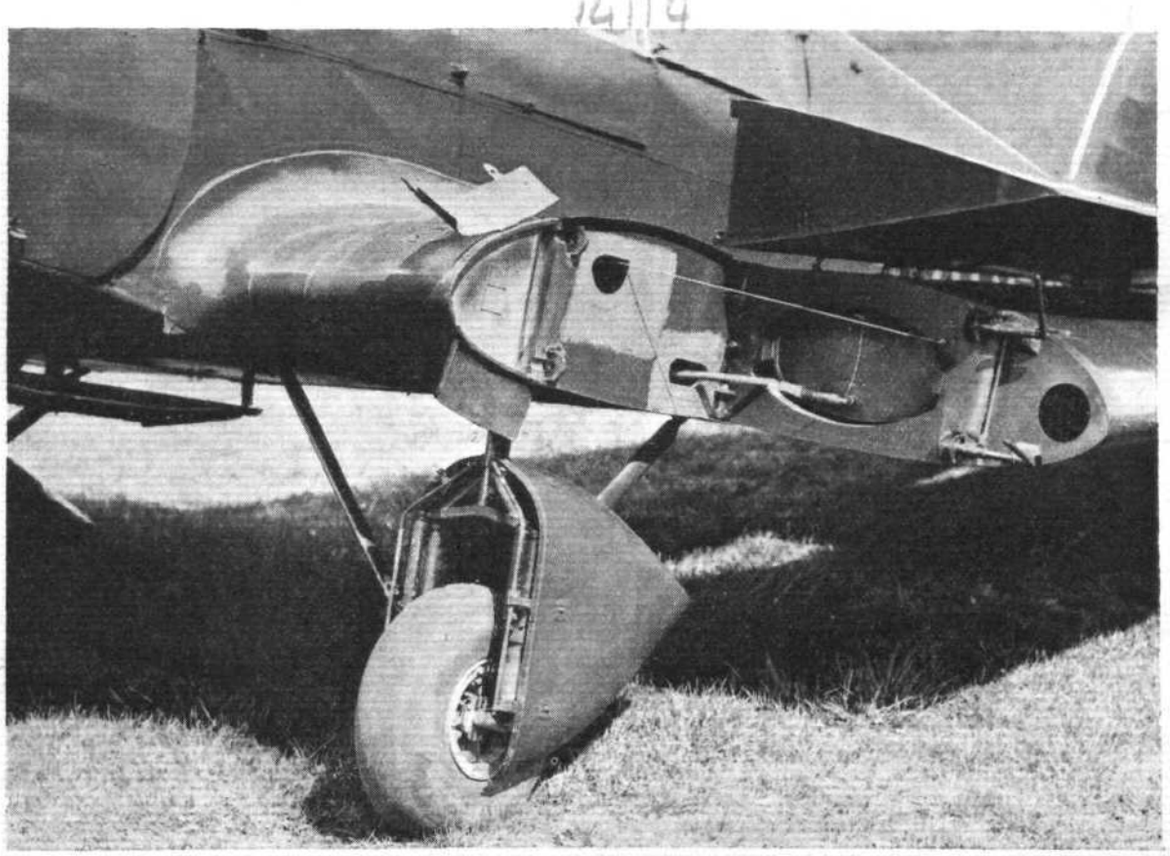
Increased comfort with no sacrifice of performance

SINCE 1932, when the Percival "Gull" appeared, machines of this type have put up some quite astounding performances for aircraft of such low power. Four "Gulls," fitted with Napier "Javelin" engines, completed the King's Cup course in 1933 at average speeds of about 150 m.p.h., and another carried Sir Charles Kingsford Smith to Australia in the record time of seven days. Others have been doing hard, if less spectacular, work in the service of private owners and air operating companies. The machine has proved itself particularly useful for fast air taxi work and for the transport of Press photographers and films.

When, last week, the 1934 model "Gull" was announced and was demonstrated by Capt. Percival at Heston, we found that the few respects in which the machine differs from its forerunner are mostly in the nature of improvements made for the comfort of the occupants and are not mere "modifications" in the accepted aeronautical sense of the word.

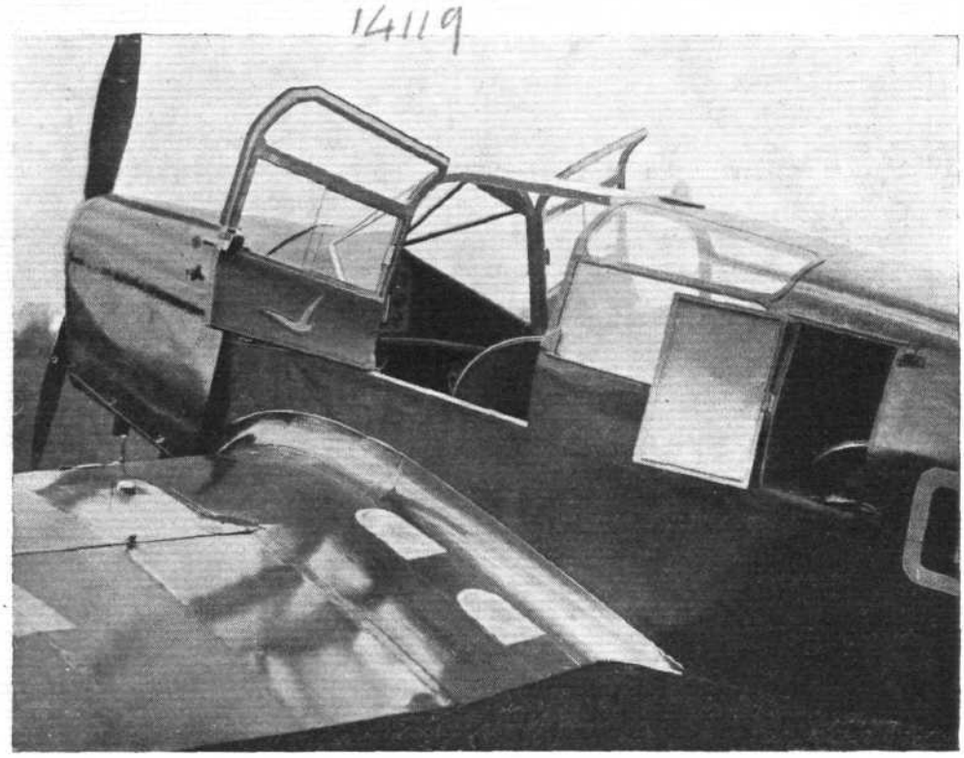
An exterior view of the new type shows few differences. Entrance to the cabin of the older "Gull" was made through a hinged roof. This arrangement, although necessitating less acrobatic skill than is needed to enter some aircraft, was by no means ideal, and the two wide doors which have now been fitted to the cabin make a great improvement. The cabin itself has been slightly enlarged and has been thoroughly sound-proofed by Rumbold & Co., Ltd. This must be considered a real improvement over the old "Gull," especially the "Javelin"-engined version, which is a rather noisy aircraft. To the rear of the cabin windows is the door of the luggage locker. Access to the locker may also be gained from the cabin itself. Both the interior and exterior finish are above the average of most aircraft.

14114



EN NEGLIGE : Showing the improved wing folding arrangements, part of the fuel system and the contents of one of the spats of the 1934 model Percival "Gull." (FLIGHT *Photos.*)

14119



A MODERN INTERIOR: Two wide doors are provided for passengers in the 1934 model "Gull." A third door gives easy access to the luggage locker.
(FLIGHT *Photo.*)

A new wing-folding arrangement which is simple, safe and easily operated is now fitted.

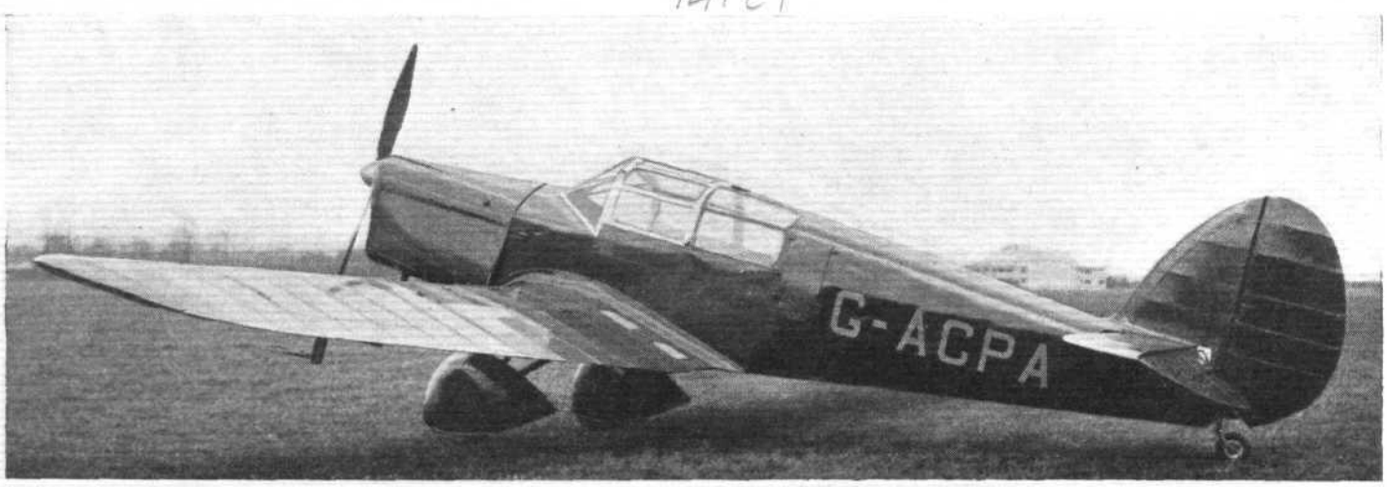
Much comment has been aroused regarding the undercarriage of the "Gull," which is of Percival design and construction. The original design was so clean that the complications of a retractable version were not considered worth while. It was, however, generally considered a little harsh, and has now been redesigned. Longer travel is provided for in the shock absorbers. The tail skid fitted to the early "Gulls" has been superseded by a swivelling tail wheel.

The "Gull" which was demonstrated by Capt. Percival at Heston last Friday was fitted with a Napier "Javelin" engine, but "Gipsy Major" and "Hermes IV" engined versions are available, and the de Havilland "Gipsy Six" engine of about 200 h.p. is soon to be fitted as an alternative power plant. At present Capt. Percival is waiting to make the first "Gipsy Six" installation in a "Gull," and this version should be flying in about four or five weeks' time. Capt. Percival expects that the top speed, with the "Gipsy Six," will be about 170 m.p.h. and the cruising speed 160 m.p.h. It should be remembered in this connection that the normal power of the "Gipsy Six" is more than the maximum power of the "Javelin," with which engine the top speed of a "Gull" is about 160 m.p.h. With a "Gipsy Major" or "Hermes IV" engine the maximum speed is about 145 m.p.h. and the cruising speed 125 m.p.h. The machine may be supplied with tankage for a range of either 550 miles or 750 miles.

For a thick-winged cantilever monoplane the "Gull" must be considered a very manœuvrable aeroplane. We have not yet done any aerobatics in it, but in the hands of Capt. Percival it appears to loop beautifully.

Capt. Percival expects that the price of the "Gipsy Six" model will be between £1,575 and £1,580.

14121



SITTING PRETTY: The 1934 Percival "Gull." Note, in this view, the neat installation of the tail wheel.
(FLIGHT *Photo.*)

THE ENGLAND-AUSTRALIA AIR RACE

FURTHER to our paragraph last week regarding the National Aeronautic Association of the U.S.A. and the England-Australia Air Race, the following statement as to the intention underlying Part A, Rule V of the conditions has been issued by the Royal Aero Club. In stipulating that each aircraft shall conform "*substantially*" to the minimum airworthiness requirements of the I.C.A.N. normal category, it is intended that all competing aircraft shall comply strictly with all major requirements affecting airworthiness and safety, such as main load factors and take-off requirements, the certifying authorities being left a discretionary latitude as to exact compliance with minor requirements. For the guidance of manufacturers and competitors it is pointed out that the responsibility for issuing the necessary certificates of compliance under this Rule rests with the respective certifying authorities. The Royal Aero Club also announces the route that has been fixed for the Handicap section of the race; this is as follows: London, Marseilles, Rome, Athens, Aleppo, Baghdad, Bushire, Karachi, Jodhpur, Allahabad, Calcutta, Rangoon, Bangkok, Alor Star, Singapore, Batavia Rambang, Koepang, Darwin, Newcastle Waters, Cloncurry, Charleville, Narromine, and Melbourne. The route for the speed race is still as previously announced, viz.: London, Baghdad, Allahabad, Singapore, Darwin, Charleville, and Melbourne.

Correspondence.

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

EMPIRE AIR SERVICES

[2919] All who are interested in the improvement of Empire communications must have been delighted to learn that the air route to Australia will be in operation before the end of the year.

The service contemplated seems to be inadequate; surely more than ten passengers per week, each way, between Singapore and Australia will require accommodation.

The time has come when all letters should be carried by air liner; we could then look forward to a daily, instead of a weekly, service to Australia.

On a route that connects Britain and Australia, via Egypt, Palestine, Iraq, India, Burma, and Malaya, the backbone of the Empire, and consequently to us the most important air route in the world, passengers will be counted by hundreds, and not by tens!

The present position with regard to the carriage of mails is unsatisfactory. We are probably paying more for their carriage by mail steamer than it would cost to have all letters sent by air and delivered in less than half the time taken by the fastest sea transport.

In fact, if all letters were sent by air, it might be possible to run our air services at a profit without subsidy from the Air Ministry.

If the present Empire postal rate of 1½d. per 1 oz. were increased to 1½d. or 2½d. per ½ oz. and surcharges for carriage by air were abolished, few would object, considering the time saved in transit.

The Post Office mail contracts also cover the carriage of second-class mail matter, *i.e.*, newspapers, parcels, etc., which could be consigned per passenger steamer as ordinary freight; as their classification indicates, there is no special urgency for their delivery, and as the P.O. contracts mainly pay for speed, once letters go by air speed need not be paid for.

To sum up:—

(1) Our Imperial communications are inadequate.

(2) We pay a large subsidy for the carriage of a small number of letters by air, the letters themselves bearing a surcharge.

(3) We pay a still larger sum for the carriage of the rest of our letters by sea, at a very low speed.

(4) Could not all letters be carried by air at less cost than we now pay for the combined services of steamer and aeroplane?

(5) Is it too late for those anxious to improve Empire communications to bring sufficient pressure on the authorities in order that the first planes that leave Croydon and Brisbane carry all His Majesty's mails?

Marlow, Bucks. WALTER L. NAYLOR.
April 21, 1934.

THE CHEAP "FLY ABOUT"

[2920] In order to meet the demand for a cheap, robust aeroplane, with low maintenance costs for club instruction and aerodrome "Fly About," may I suggest to manufacturers that something similar to the old D.H.6 would fill the book. It was originally designed for this purpose and fulfilled it admirably.

The seating arrangement enabled the pupil and instructor to see what one another were doing, there was plenty of seating and shoulder room and no instrument board within an inch or so of the pilot's face, consequently pilots were seldom injured in really bad crashes. It was also extremely easy to get into and out of. I think one could land it in a smaller space than any present-day machine, and therefore one had no trepidation at the prospects of a forced landing, and it was ideal for just enjoying the air.

I think, therefore, that if it could be cheaply produced again, with a very few improvements, it would fill the demand.

V. N. DICKINSON.

Hertfordshire Flying Club, St. Albans.
April 22, 1934.

Book Reviews

"Combat." An epic history. By Barré Lyndon. (Heinemann, Ltd.) Price 7s. 6d. net.

YOUNG and old motorists have followed, with perhaps greater interest than that displayed for any other make of motor-car, the growth of M.G.'s. Most people know that the M.G. in its original form was an attempt on the part of one man to produce a car suitable for the private owner to race with a reasonable chance of success without large expenses. Mr. Cecil Kimber is a courageous man, who is not afraid to back his own conviction, and, what is more important, to profit by his failures. Just how he has done so is very fully described in "Combat," by Barré Lyndon. Most books of this nature are not only very blatant trade "puffs," but are also written in execrable journalese; "Combat" isn't. The descriptions of the races and trials are good and everyone who is an M.G. enthusiast—and most pilots are—should make a point of reading how their cars came into being.

Kenley R.A.F. Aerodrome

NOS. 3 AND 17 FIGHTER SQUADRONS will shortly move from Upavon to Kenley. These two units have been stationed at Upavon for a long time, and have been partners in various chances and changes of R.A.F. life. At one time they were the only two squadrons equipped with the Hawker "Woodcock" night-fighter. Then they were the first two units to receive the "Bulldog" day-and-night fighter. Upavon, famous for so long as the home of the C.F.S., is not an ideal station for units of the Fighting Area, A.D.G.B., as it is too far away from the probable area of hostile raids. Kenley is in the so-called "inner ring," but since 1932 it has been undergoing reconditioning, old war time buildings being replaced by modern ones. Before this work began, Nos. 23 and 32 Fighter Squadrons lived at Kenley, but they were moved to Biggin Hill, which had just undergone similar reconditioning. All the squadrons of the Fighting Area will soon be located in this inner ring, but it looks as if still more accommodation for Defence units will soon be necessary.

Appreciation

THE opening article of the April issue of the Danish journal *Flyv*, the official organ of the Royal Danish Aeronautical Society, is entitled "Is Denmark, in comparison to its size, the largest purchaser of English aviation material?" The article, which incidentally is written in excellent English by Capt. J. Foltman, Editor of *Flyv*, points out the range of aviation material which Denmark has bought from England, and substantiates the claim made, that in proportion to its size, Denmark is our best customer. Bravo, Denmark!

Airisms from the Four Winds

Day visits to Berlin

Now that both the K.L.M. and Luft Hansa have faster machines, their joint service to Berlin enables a business man to leave Croydon at 7 a.m., spend four hours in Berlin, and to return in time for dinner.

Prince George's return

After disembarking at Southampton, Prince George flew in a D.H. "Dragon" from the airport to Smith's Lawn, Windsor Great Park.

Hunting "Public Enemy No. 1"

Aeroplanes were used in the search for John Dillinger, the American Criminal Romantic.

Aerial salvage

While flying a "Dragon" on the Jersey-Heston service, Flt. Lt. Maslin noticed that a motor yacht was flying distress signals. After circling the yacht, he signalled an American steamer, and then continued, with his load of passengers, to Heston.

A Soviet speed-up

Air transport will have reduced the travelling time between Tiflis and Moscow from four days to a mere twelve hours when a direct service is put into action. The route now passes through Ordzhonikidze, which is rather less difficult in its old form of Vladikavkaz.

The Graf Zeppelin—

On May 26 the South American airship service will be reopened and services will run once a fortnight through the summer. The *Graf Zeppelin* will leave Friedrichshafen on each second Saturday and Rio de Janeiro on each second Thursday.

—and the new L.Z. 129

Work on the second airship for the service is rapidly going ahead and it may be seen daily by visitors while under construction, each 3,000th having a right to a free trip in due course. It is stated that cars can be accommodated in the freight room at the base of the hull!

Still faster

Mr. Percival tells us that he intends to instal a "Gipsy Six" engine in the "Mew Gull." The top speed should be raised by about 10 m.p.h. and the take-off, cruising speed and rate of climb should all be considerably increased.

Smuggling a la mode

Furs are being smuggled from Newfoundland by Canadian fur buyers who send an aeroplane from Montreal to collect the winter's catch from trappers as far north as Cartwright. There is no Customs authority stationed on the Labrador coast at this time of the year, and the furs collected are transported by air to Blanc Sablon, in Canadian territory, without passing through the Customs.

A SPARTAN IN SWEDEN: This Spartan ("Hermes II") is used by Wideroe's Flyveselskap of Oslo for flights up to the mountains. It is shown fitted with skis, and Lt. A. Wideroe is seen attending to the skis for his own undercarriage.

German meteorological services

The entire meteorological organisation of Germany, including the naval weather station at Hamburg, is to come under the administration of the German Air Ministry, which, up to the present, has controlled only the aeronautical weather bureau.

Higher still

Renato Donati, the Italian airman, who, in a "Caproni 113," has just broken the altitude record, announces that he intends to try to break this record by a still greater margin. With this end in view he is experimenting with a special airtight suit, and meanwhile Gustave Lemoine, the chief test pilot of the Potez Company, who, in a "Potez 50" machine, reached a height of 47,400 ft., also intends to make another attempt on the record.

The Coupe Deutsche

Two machines have been entered by the Potez Company for the Coupe Deutsche de la Meurthe. One will be a modified version of the machine which won the race last year, but the second is an entirely new type. The first has already been flown by Lemoine, and covered 311 miles at an average speed of 205.34 m.p.h. A Potez engine of 315 h.p., driving a Ratier variable-pitch airscrew, was used. The new type machine is also equipped with a Potez engine and this is reported to give between 340 and 350 h.p. at 2,100 r.p.m.

Miss Batten forced down

After leaving Lympne for Australia on April 22, Miss Jean Batten made a forced landing in the dark near Rome and her machine was damaged. Head winds had reduced her ground speed and the machine had, it seems, run out of fuel.

Lockheeds in Europe

The Fokker Aircraft Company of Amsterdam are now exclusive representatives in Europe (including Russia, but excepting Switzerland) of the Lockheed Aircraft Corporation. Already the company has sold an "Electra" to the French Air Ministry and has ordered, for its own use, an aircraft of the same type. This machine will be used during the summer for demonstrations to government officials and operators.

A "power balloon"

An airship built by the Zodiac company is at present being tested by the French air force. This is of the "Caquot" type, with a capacity of 35,200 cu. ft., and the present nacelle may be replaced by a long fuselage with a 60 h.p. Salmson. A top speed of 28 m.p.h. in still air is expected.

Consolidated closes down

With several important orders standing, the Consolidated Aircraft Corporation of Buffalo, New York, has, owing to a strike, closed its factories for an indefinite period. The orders include twenty model 10-G Fleet Training aircraft awaited in Roumania and these machines are to be fitted with D.H. "Gipsy Major" engines built under licence in Roumania.

French pilot's American machine

Recently a Lockheed "Orion" was landed at a French harbour for an unknown destination. It turns out that the machine is the property of Detroyat, the chief test pilot to the Morane Company, and that he acquired the machine during his honeymoon in the United States with a view to entering for the MacRobertson England-Australia race. The machine will be fitted with an air-cooled Hispano-Suiza engine.

TO AUSTRIA AT WHITSUN

British private owners invited on organised tour

A FLIGHT through Austria has been organised by the Austrian Aero Club, and Prince Kinsky, the President, has invited British private owners to participate in it. This flight, which is under the patronage of the Federal Minister of Commerce and Communications, His Excellency Fritz Stockinger, will be arranged between May 19 and May 27.

On the morning of the first day the participants will foregather at Altenrhein aerodrome, and they will spend the night at Bregenz, to which place they will be taken by motor car or steamer. The following day the party will fly to Innsbruck, the next day to Salzburg, on Tuesday to Linz for lunch, and then to Vienna, where Wednesday and Thursday will be spent. On Friday morning they will fly to Graz for lunch and to Klagenfurt for dinner. On Saturday there will be trips from Klagenfurt, and on Sunday to Gastein for lunch and to Innsbruck for the night.

Apart from the actual daily journeys, excursions are arranged at each stopping place, and the inclusive charge for the nine days is 300 Schillings, which includes hotel bills, all meals, and the cost of transport by motor car, steam boat, mountain railways, as well as entrance fees and tips. There will be no landing or housing charges at aerodromes, but the cost of fuel and oil must naturally be borne by the owners. Until May 1 entrance will cost 50 Schillings, and afterwards, until May 14, 100 Schillings. Entries accompanied by these fees should be made to the Secretary of the Osterreichischer Aero Club, IV, Argentinierstrasse 29. The entry fee will be deducted from the cost of the trip, which must be paid on arrival at Bregenz.

The Austrian Aero Club have in the past proved themselves the most generous of hosts, and the other flights they have organised have invariably been extremely enjoyable affairs. Everyone, therefore, who can is well advised to go over.

TELLING THE MAN-IN-THE-STREET

Imperial Airways' Exhibition at Charing Cross

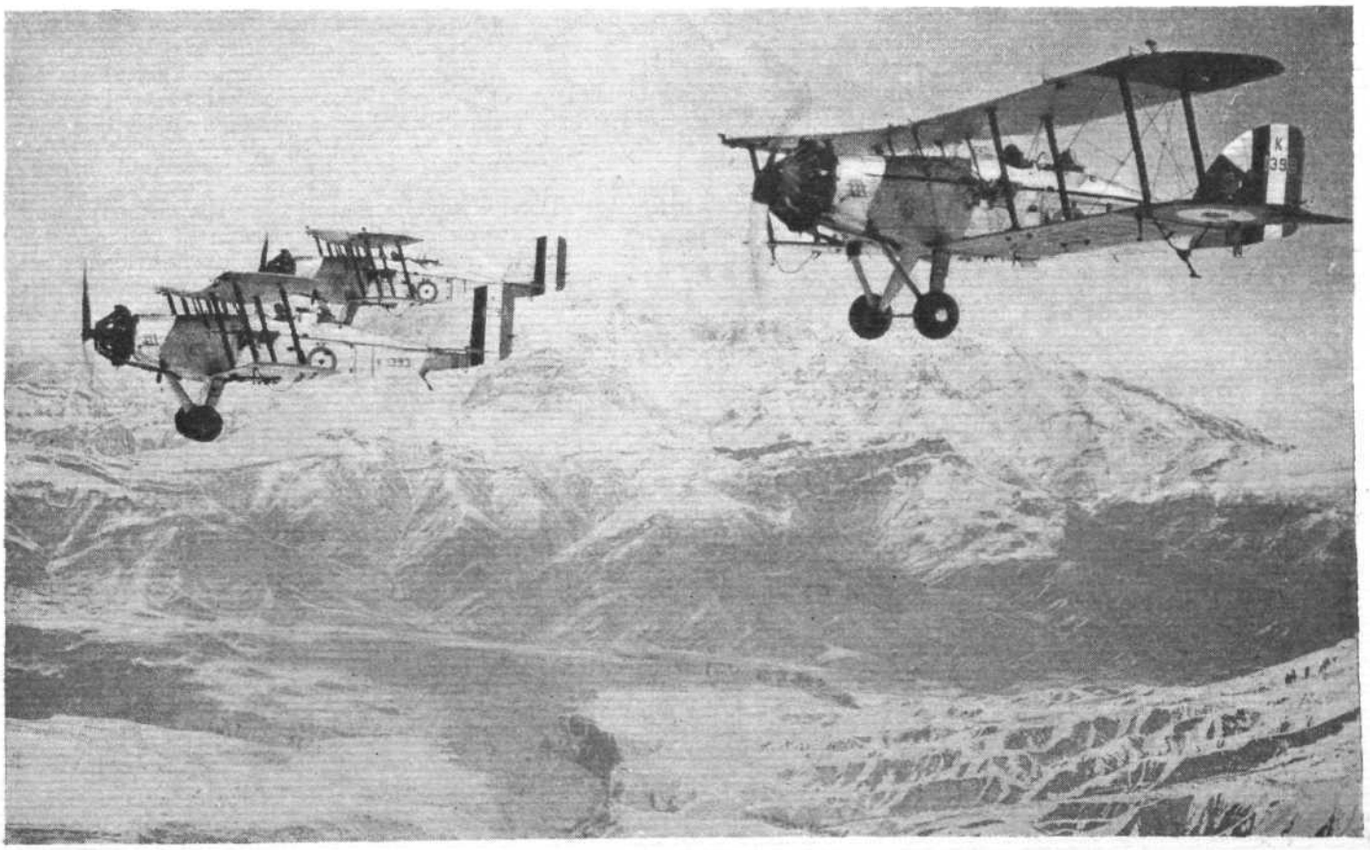
INTERESTED people of all ages are thronging the booking hall at Charing Cross Underground Station, where a display of models and photographs dealing with modern air transport, staged by Imperial Airways, opened last Monday.

There are part-sectioned models of the "Heracles" and "Atalanta"-type machines, and others of the "Scylla," emphasis in each case being put upon passenger accommodation rather than on the purely technical aspect.

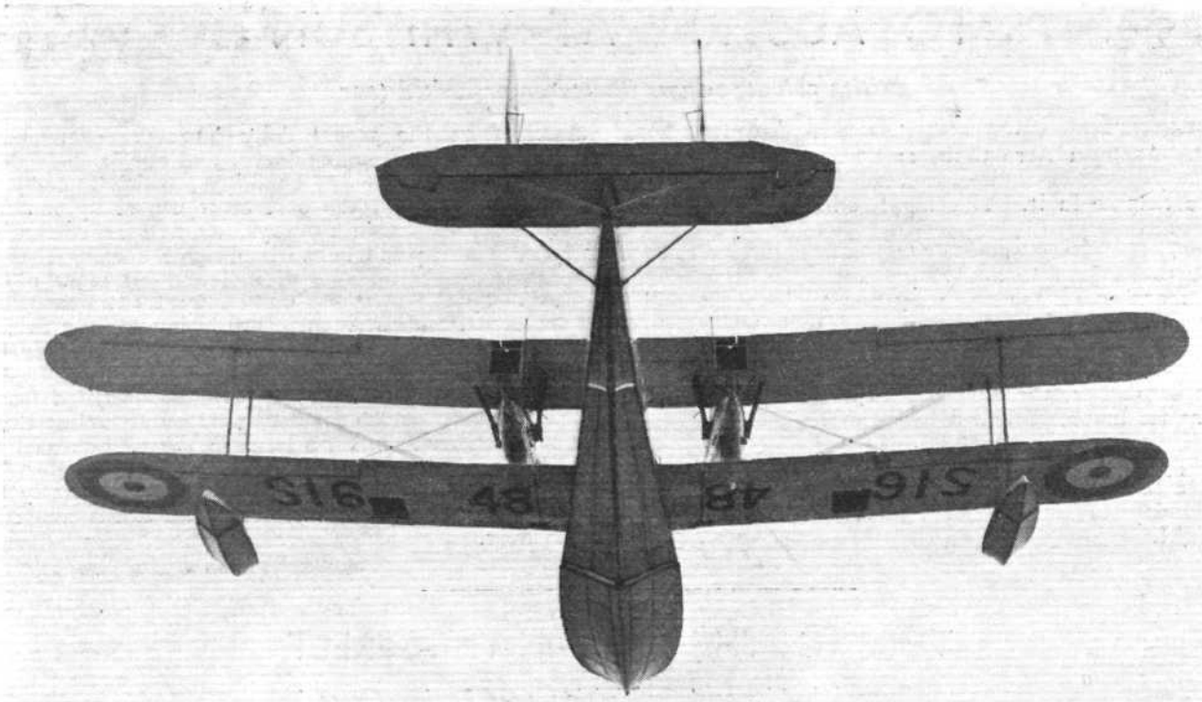
Impressive enlargements show the operations of Imperial Airways in all their branches, many of them illustrating aerodromes and rest-houses on the Empire route. There are also a number of exceedingly interesting photographs taken during the construction of the "Scylla."

Uniformed representatives of Imperial Airways are present to answer questions—and they are having a busy time.

The display remains open until May 5.



SERVICE MOUNTAINEERING: Part of the work covered by No. 30 Bomber Squadron, stationed at Mosul, in Northern Iraq, is to patrol the mountains of Kurdistan, on the borders of Iraq and Turkey and Persia. This is an extremely hazardous flight and is carried out weekly. The patrol lies over mountainous country where for more than an hour engine failure or any other cause of a forced landing would mean a certain crash. This picture was taken during an actual reconnaissance patrol made by three "Wapitis" of the No. 30 Bomber Squadron over the mountains of Kurdistan, in Northern Iraq.



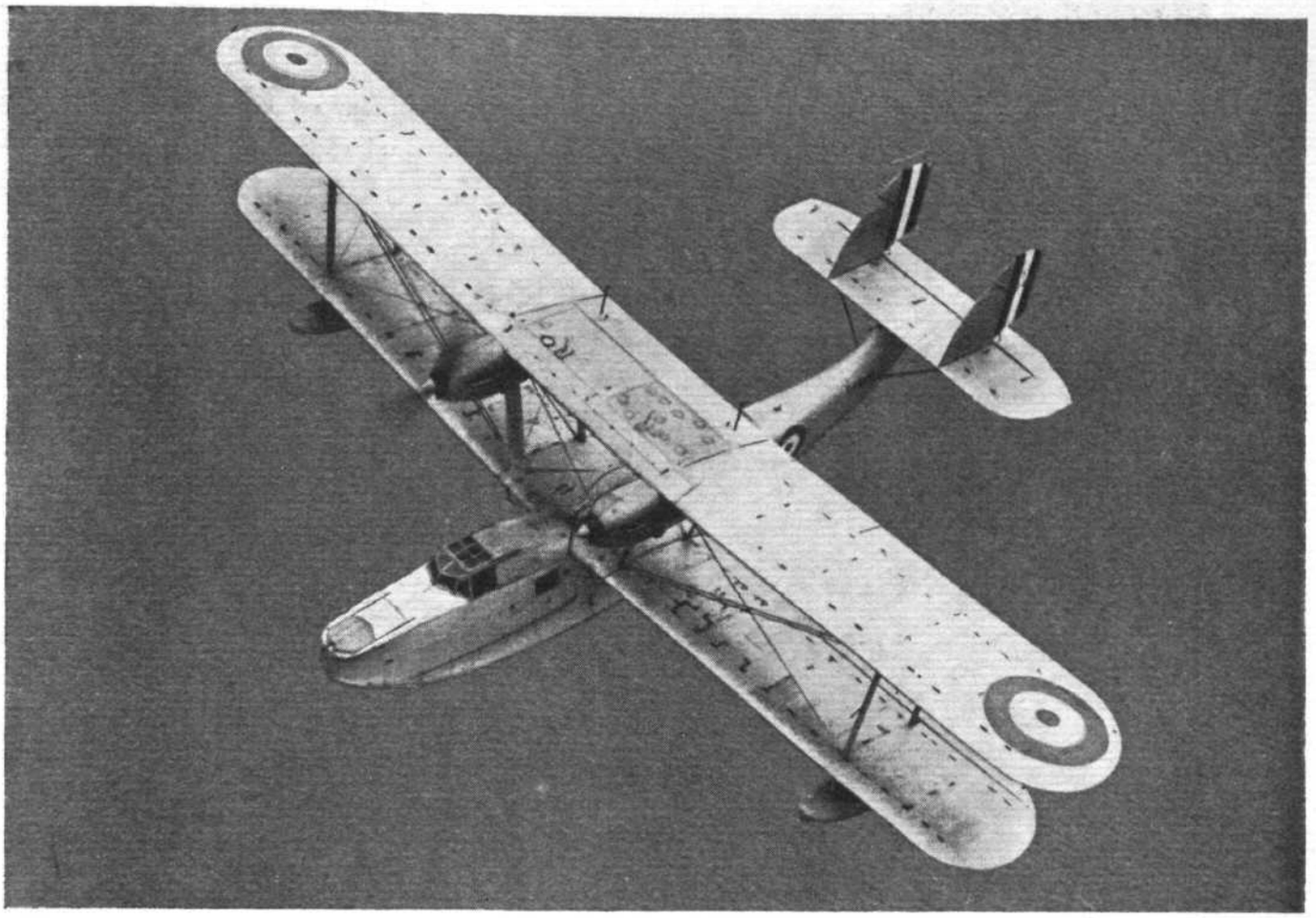
VICKERS SUPERMARINE "SCAPA"

A non-stop flight of 10 hours' duration followed by trials totalling 15,000 miles preceded the placing of an order by the British Air Ministry for a number of "Scapa" flying boats fitted with Rolls-Royce "Kestrel" engines

AFTER a period which many regard as needlessly long, the re-equipment of the Coastal Area flying-boat squadrons has begun in real earnest, and among the types to be adopted is the "Scapa," designed and built by the Supermarine Aviation Works (Vickers), Ltd., at Woolston, Southampton. Rarely has the prototype of an aircraft destined for the R.A.F. been subjected to such searching tests as those which preceded the placing of the order for the "Scapas." First the machine completed a non-stop flight of ten hours over the North Sea, and then it was flown to the Mediterranean and down the Nile, getting as far south as Port Sudan on the shores of the Red Sea. During its cruise the machine covered the distance of 15,000 miles, in the course of which the following non-stop flights were made:—Plymouth-Etang de Berre; Etang de Berre-Malta; Malta-Gibraltar; Gibraltar-Malta; Malta-Aboukir; Aboukir-Lake Timsah; Lake Timsah-Port Sudan; Port Sudan-Lake Timsah; Lake Timsah-Gulf of Sollum; Gulf of Sollum-Malta; Malta-Gibraltar; Gibraltar-St. Nazaire; St. Nazaire-Felixstowe.

The full schedule of tests planned was successfully carried out, and included take-offs, maintaining flight and climbing on one engine. While the machine was afloat, each of its two engines was changed by the aid of the portable slinging gear carried on board. Thus it is evident that the "Scapa" can be operated as a self-sufficient unit far from its base, provided the necessary fuel bases within its flying range are available. Performance figures have not

ASHORE: The "Scapa" on its launching trolley. The machine is not an amphibian, and the trolley is, of course, left behind when the flying boat is afloat.



FROM ABOVE : The " Scapa " has a normal biplane wing structure, with struts and wires reduced to a minimum. The engines are Rolls-Royce " Kestrels."

been issued, but from the fact that the prototype made a flight of ten hours it is evident that the maximum range is considerably in excess of 1,000 miles.

Aerodynamic Design

Quite remarkable care has been taken in the design of the " Scapa " to reduce head resistance. The hull itself has very clean lines, and on it is mounted a wing structure in which the number of parts has been reduced to a minimum. Apart from the slanting struts which carry the two Rolls-Royce " Kestrel " engines, there is but a single pair of inter-plane struts on each side. The engine nacelles themselves are of streamline form, and by placing the water radiators at the rear end of the nacelle, the usual unsightly and drag-producing excrescences are avoided. Lateral stability on the water is ensured by two wing-tip floats, also of low-drag form and mounted each on a single pair of struts.

A monoplane tail is carried on the rising stern portion of the hull, to which it is braced by two struts on each side. Above the tail plane are mounted two vertical fins carrying horn-balanced rudders. The " blind " area caused by the tail is not, therefore, large, and the rear guns have a wide field of fire.

Military Accommodation

The " Scapa " has been designed to be used for reconnaissance, bombing, torpedo transport, and training and navigational instruction. The character of the military load carried will, of course, depend upon which of these functions the machine is fulfilling, but the arrangement of the crew's stations remains the same. In the extreme bows there is a special machine-gun mounting, which can be removed and stowed farther aft, leaving the front cockpit free for mooring operations, etc. This cockpit has, in the extreme nose of the hull, a hinged watertight door which is used for bomb sighting.

Between the forward cockpit and the wings is the pilots' compartment, which in the " Scapa " is provided with a sliding roof and side windows. The navigator and engineer are housed aft of the pilots' cabin, between it and the hull frame which carries the front lower wing spar, while slightly farther aft, between the two spar frames, is the W/T operator's station. Behind the wings are the two rear gun positions which, as already mentioned, afford very good tail protection owing to the shape and location of the tail surfaces.

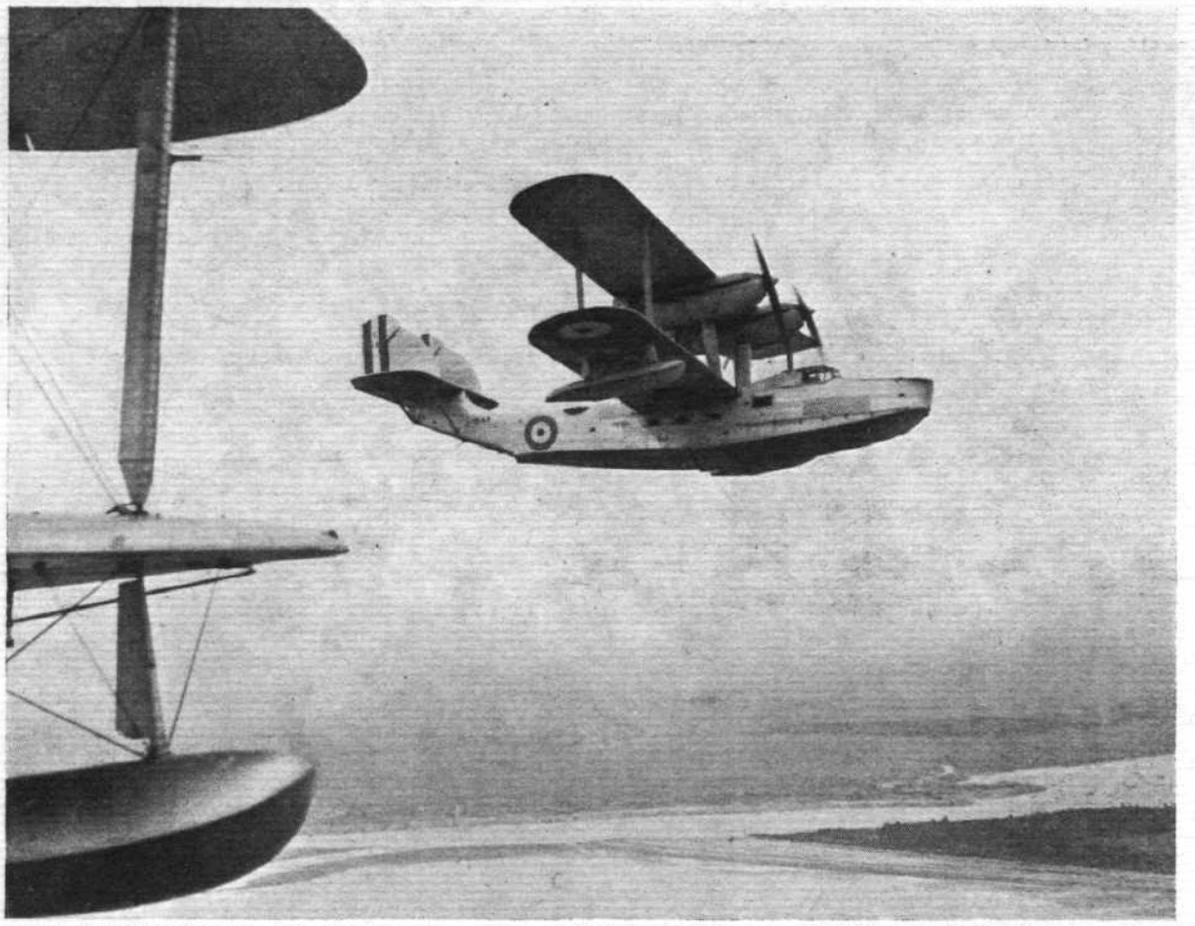
If the " Scapa " is being used for extended cruises, provision is made for sleeping accommodation, food and water stowage, cooking table and other special equipment. Stowage is also arranged for a collapsible dinghy, an engine ladder, an engine maintenance platform and a spare airscrew.

Structural Features

Light alloys and stainless steel are the chief structural materials of the " Scapa." The stainless steel is used mainly for highly-stressed fittings, and the light alloy for planking, frames, wing spars and wing ribs. Doped fabric is used for covering the wings and tail surfaces.

Extensive tank tests on models resulted in a hull form which combines low air drag with clean running on the water and good seaworthiness. At the same time, the hull form is not such as to call for very slow and expensive construction. The sides, for example, are flat, so that *panel-beating (or " tin bashing " as it is called in the* shops) is reduced to a minimum. The underwater portion, between keel and chines, is of curved vee form, the curvature below the chine being designed to keep down the spray. The usual two steps are found in the hull bottom, the main step being approximately under the centre of gravity, while the rear step is placed well aft towards the stern. This arrangement has been found useful in preventing porpoising.

Normal practice has been followed in the wing structure, Duralumin and Alclad being the materials used for spars and ribs, and stainless steel for fittings. The wings are of equal-span biplane form, and the ailerons, fitted to all four wings, have Frise balances. The one-piece elevator has a horn balance at each end, arranged in a somewhat unusual way. Instead of the horn balance of approxi-



" FORMATING " : The Vickers Supermarine " Scapa " photographed from a " Southampton."

mately triangular shape, those of the " Scapa " elevator are of rectangular form, and are inset in the tailplane, not at the extreme end but a short way from the tips. The trailing edge of the elevator has been cut away at an angle, probably in order to render the inset balances more effective.

Engine Installation

Two objects were achieved by placing the " Kestrel " engines immediately under the upper wing in the " Scapa." The position should give low air drag, and at the same time the airscrews are kept well clear of spray. The exhaust tail pipes are pointed outwards so as to keep the hot exhaust gases from striking the radiators, which, as previously mentioned, are placed at the tail ends of the nacelles, under the trailing edge of the top plane.

Two petrol tanks are housed in the top centre section. Each tank has a capacity of 230 gallons, and supply to the engines is normally by direct gravity feed from the tanks. Pumps are, however, provided to ensure an adequate supply of fuel at abnormal attitudes (such as very steep climb) when the tanks are nearly empty. Should the pumps fail, the fuel is bypassed and the gravity head is sufficient for normal attitudes. Oil is carried in two tanks which form the leading edge of the top centre section and incorporate oil coolers.

Special attention has been given to ease of maintenance, and although the high placing of the engines has rendered them slightly inaccessible, the use of engine ladders and platforms facilitates the work, while large manholes enable the accessories at the back of the engines to be reached.

For launching the " Scapa " from a slipway or from the beach, and for bringing it ashore again under its own power, a launching trolley is provided. This consists of two separate units, each comprising a wheel and three struts. Each unit is attached at three points by quick-release pins: two points on the hull and one point on the lower wing. A tail trolley is also supplied.

It is possible that the beholder of one of the production type " Scapas " may rub his eyes and wonder what new three-engined flying boat he is seeing. For emergency provision has been made for carrying a spare engine on the lower centre section. The absence of central struts leaves an open space on the centre line of the machine, in the angle between the centre-bay wing bracing wires and internal supports are provided so that a spare engine can, if necessary, be carried here.

AERO GOLFING SOCIETY

THE Aero Golfing Society played Martlesham and Felixstowe on April 14, 1934, at Felixstowe Golf Club. The Aero Golfing Society won by 15 matches to 3. The scores were as follows:—

SINGLES

Flt. Lt. L. Massey Hilton	1	Sqd. Ldr. P. C. Wood, Felixstowe	0
		Flt. Lt. E. D. Barnes, Old Martleshamian	0
A. J. A. Wallace Barr	1		
F. E. N. St. Barbe	0	F/O. E. M. Morris, Martlesham	1
		Flt. Lt. C. B. Wincott, Old Martleshamian	0
C. R. Fairey	1		
Major C. J. W. Darwin	1	Flt. Lt. V. S. Parker, Martlesham	0
		Sqd. Ldr. E. C. Emmett, Felixstowe	0
Lt. Col. W. A. Bristow	1		
Brian Lewis, The Hon.	1	Flt. Lt. D. Menzies, Martlesham	0
		Flt. Lt. H. G. Sawyer, Felixstowe	0
H. E. Perrin	1		
		Flt. Lt. G. E. G. Richmond, Martlesham	0
C. S. Thom	1		
		Flt. Lt. R. H. Carter, Felixstowe	0
Capt. L. G. Callingham	1		
F/O. J. Summers	1	Sqd. Ldr. H. W. McKenna, Martlesham	0
F. Handley Page	1	Flt. Lt. J. N. Boothman, Martlesham	0
	11		1

FOURSOMES

1. Flt.Lt. L. Massey Hilton A. J. A. Wallace Barr	1	Sqd. Ldr. P. C. Wood Flt. Lt. E. D. Barnes	0
2. C. R. Fairey Major C. J. W. Darwin	1	Flt. Lt. C. B. Wincott Flt. Lt. V. S. Parker	0
3. F. E. N. St. Barbe Lt. Col. W. A. Bristow	0	F/O. E. M. Morris Sqd. Ldr. E. C. Emmett	1
4. H. E. Perrin C. S. Thom	1	Flt. Lt. H. G. Sawyer Flt. Lt. G. E. G. Richmond	0
5. Capt. L. G. Callingham Brian Lewis, The Hon.	0	Flt. Lt. R. H. Carter Flt. Lt. D. Menzies	1
6. F/O. J. Summers F. Handley Page	1	Sqd. Ldr. H. McKenna Flt. Lt. J. N. Boothman	0
	4		2

From the Clubs

HANWORTH

A challenge has gone forth from Hanworth to the southern clubs, and those who accept, and succeed in creeping through the defence next Sunday morning, will be rewarded with the usual free breakfast. By this time inveterate Dawn Patrollers must have evolved sound systems of attack and defence for all kinds of weather.

A new member, Mr. Dampney, has started on his way towards a "B" licence, for which Mr. L. Ramsay has just completed all flying tests, reaching Lympne successfully from Croydon on Friday night. Two cross-countries, to Castle Bromwich and to Thornaby-on-Tees, were made by Mr. Holder, and Lord Sempill took off on Saturday in his "Puss" for Scotland. Altogether, 42 hours were flown during the week by club machines.

BROOKLANDS

Despite high winds, the week's tonnage has been quite high, with 60 hr. 30 min. dual and solo. Miss Jean Batten started her flight to Australia, was held up by weather at Lympne, and, unfortunately, we hear, damaged her machine in a night landing near Rome. Messrs. F. A. White, W. Stranger and D. Ross are all after their "B's," and the first named has completed the night-flying part of the business. Three members "soloed" for the first time during the week, and the club now has a receptionist and outside agent on the staff in the person of Mr. M. N. Crossley.

SHOREHAM

Another club has found that variety in machine types, though bad for ground engineers, is good for trade, so to speak, and the recent experiment of the Southern Aero Club in having high-wing and low-wing monoplanes as well as a normal training biplane has resulted in an increase of flying hours. During the first fortnight of the month 52 hours were flown. Among the new members, Mrs. Barnes has just purchased a sports "Fox Moth" and a specially finished "Hawk," and the week's visitors included a "Dragon" from Le Touquet, the pilot of which found, in Shoreham, the only clear aerodrome in South-East England. The club is organising a flying display to-day, Thursday, which will include the usual events.

HATFIELD

In spite of bad weather, the London Aeroplane Club has managed to put in nearly 68 flying hours and the R.A.F. Flying Club more than 9 hours during the week. At the former club Mr. Cochrane flew his "A" tests, and at the latter several "cross-countries" were carried out, including one to Ireland by F/O. D. A. Rea. During the week-end before last, summer momentarily appeared with excellent results, and some sixty people booked tables for the dance on Saturday evening.

CASTLE BROMWICH

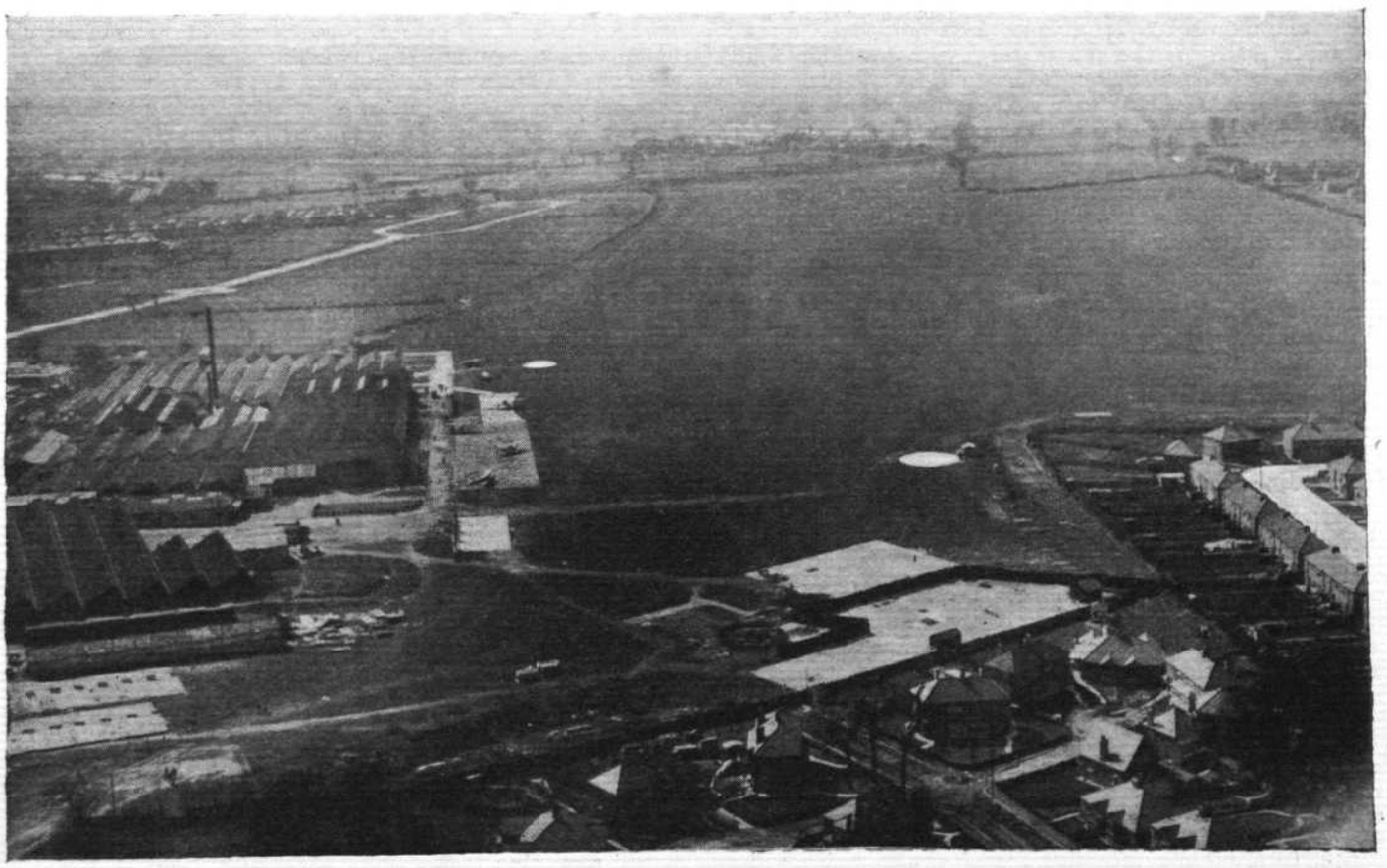
At last the Midland Aero Club have their new equipment—three "Gipsy Majors" straight from the works—but a few old members must have wept inwardly as "L.T." was handed over. Once a "Cirrus I" and now a "Cirrus II," "L.T." must be the oldest "Moth" in the country, with 2,450 hours—so many of them hard landing circuits—to its credit. Altogether the four machines have done some 4,800 hours. The familiar green has been discarded in favour of a brighter colour scheme, and the "Majors," which were flown back in formation from Heston last Thursday, are red and silver. Flying times last week were 17 hr. 45 min. dual and 13 hr. 10 min. solo, and Mr. H. S. Goodby passed his tests.

YEADON

The members of the Yorkshire Aeroplane Club have now taken over from National Flying Services, Ltd., and the deal was completed on April 19. Mr. S. A. Thorn, who is Henlys' representative at Barton Airport, and Mr. W. A. Scales have joined, and 18 hours were flown during the week.

BROXBOURNE

High winds hampered solo flying during the week, but nearly 51 hours were flown by the Herts and Essex Aeroplane Club. Six new members have joined, including Mr. Van, of Quebec, who is going for his "B" and ground engineer's licences. Several cross-countries were carried out by Mr. Allington, including one of 400 miles. Club building extensions are progressing and should be completed during May, when the occasion will be celebrated by an official opening and dance.



A MEMORY NOW: Greater London is taking Stag Lane remorselessly in its stride.

LYMPNE
Another " new equipment " club is the Cinque Ports, who hope shortly to take delivery of their new " Leopard Moth," which should surely increase the average hourage. Bad weather during the week kept both members and Miss Jean Batten on the ground, and the total flying time was only 21 hours, but the British Klemm was demonstrated earlier in the week when conditions were good. Mr. Topham, of the club, has kept the ground staff busy with the overhaul of his Bristol Fighter.

READING
Hanworth's Dawn Patrol announcement has made it necessary for the Reading Aero Club's invitation to be postponed until May 20, and another date worth noting is that for the W. J. Barnes Cup tests, which start on May 1. Long distances, in both vertical and horizontal planes, were covered in the fine weather last Sunday, when several members made earnest cross-country flights and one proceeded up to 15,000 ft. in a " Gipsy." Vertical descents—with Russell-Lobe parachutes—have also been continuous. Actually 31 descents were made in various places with this parachute, and 11 of these were made by amateurs at Reading.

WOODFORD
Thirty hours were flown during last week by the Lancashire Aero Club, and Dr. J. W. A. Hunter graduated to the long cross-country category. Arrangements have been made whereby medical examinations for " A " licences can be carried out at the club-house, and applications should be made to the Secretary.

HOOTON
A total of 34 hours 30 minutes were flown during the week by the Liverpool and District Aero Club in conditions that were, for the most part, bad, with high winds and rain.

RENFREW
The Scottish Flying Club sent one member, Mr. A. F. Swart, on his first solo, and the week's flying time totalled 9 hours 50 minutes. Extensive draining operations are taking place on the aerodrome.

CAMBRIDGE
Several cross-country flights were made from Marshall's Flying School, and the week's flying totalled 28 hours 25 minutes. Mr. A. T. Loch completed all " A " licence tests and Mr. R. B. Finney his flying tests.

LANCASHIRE v. LEICESTERSHIRE
An unfortunate error crept into our Club Notes of April 12 last. At the end of the Lancashire Aero Club's report was an announcement to the effect that " The Annual Staff Vacation had been fixed from April 20 to May 4, both days inclusive, during which period the clubhouse and aerodrome would be closed." We are afraid we must have lost our heads—or rather " heading " —for this paragraph should have come under the *" Leicestershire Aero Club."*

MOUSEHOLD
Last week the Vice-Chairman of the Norfolk and Norwich Aero Club, Mr. C. G. Gowing, was married, at Ketton, to Miss Pauline Wilson, and Mr. H. Birchall flew over to attend the ceremony and landed at Wittering. A visitor from Switzerland, M. R. Le Coutre, went solo after a fortnight's flying and eight hours' instruction. Quite a number of flying visitors arrived during the week, including Air Commodore R. H. Verney, O.B.E., who flew in a " Tutor " from Cranwell, and Mr. J. H. Musker, who gave a demonstration of the British Klemm.

CARDIFF
Both Lord Willoughby de Broke, M.C., and Charles J. Rhodes, Esq., have consented to become Vice-Presidents of the Cardiff Aeroplane Club, Ltd., whose patron is H.R.H. the Prince of Wales. During last week dual and solo flying totalled 31 hr. 18 min., with one first solo and two "A" licences, and Mr. R. R. Smith showed an excellent film of war-time flying.

HAMBLE
The Hampshire Aeroplane Club's first spot landing competition was won on April 15 by Major C. E. Jenkins, and last Sunday the Club " dawn patrolled " to the Sussex Aero Club. During the fortnight terminating on April 22 the flying hours totalled 178, and those for last Sunday created a club record—28 hours 15 minutes.

BOMBAY FLYING CLUB
The three machines of the Bombay Flying Club, Ltd., have completed their tour of some 2,200 miles around N.W. India. The aircraft left Bombay at 8.30 a.m. on March 20 and proceeded to Jhansi, refuelling at Mhow *en route*. The night was spent at Jhansi and at 7.30 a.m. on the 21st the formation left for Agra, where the pilots visited the Taj Mahal and Fort. After lunch, the journey was continued to Delhi—strong head winds were encountered on this lap of the journey. Remaining overnight at Delhi, the start was made after lunch on the 22nd for Jodhpur. At dawn on the 23rd the start was made across the Sind desert to Karachi, via Hyderabad. Minor repairs were carried out at Karachi by Mr. L. A. Read, the Club's engineer, before the final return to Bombay, via Rajkot, on the 24th. Bombay was reached at 2.10 p.m. on that date, the whole journey of some 2,200 miles being completed in 26 hours 15 minutes per machine. The pilots of the machines were Mr. J. D. Mody, Mr. K. R. Gazdar and Mr. F. S. Mehta. The Club's instructor, Flt. Lt. Alan Binley, and Mr. L. A. Read, the Club's ground engineer, accompanied the formation. This trip was organised to give " B " licensed pupils at present under instruction the full benefit of practical experience of cross-country flying, map reading, etc., which is required in their capacity as professional pilots. Thanks is accorded to Burmah Shell for their organisation and refuelling facilities afforded at intermediate landing grounds.

Following the success of this trip, the Club intends sending three machines to England during the monsoon months —two pilots under training of the Club have booked aircraft for this flight.

GLIDING AT DUNSTABLE

London Club member makes flight of more than 50 miles and reaches height of 4,200 ft.

FINDING that he was unable to obtain an efficient sailplane at a price he could afford in England, Mr. G. E. Collins, a member of the London Gliding Club, recently obtained one from Germany. On Sunday, the " Rhonadler," as his sailplane is called, piloted by Mr. Collins, and by the aid of thermal currents was able to fly from the Club's ground at Totternhoe, near Dunstable, to Rayleigh, near Southend, a distance of about 55 miles. During this flight, which took only an hour and a-half, the machine reached a height of 4,200 feet, a feat which is claimed as an English record.

Mr. Collins has the distinction of being *ab initio* trained by the Club, that is, he has never had any power aircraft experience. His feat is therefore not only meritorious in itself, but is also a triumph for the Club, which has consistently advocated its training methods as the best ones, and has grown in strength in the face of many difficulties.

Gliding is rapidly becoming more popular and a visitor to Dunstable any week-end, and indeed on many days during the week as well, will always find many machines in use. The number of flying hours put in by the members is astonishing, especially when it is realised that a normal glide down the slope during the training period is only a matter of seconds.

The Dunstable site is not only excellent for gliding, but there is sufficient ground there for power-driven aeroplanes to be landed at the foot of the hill. Pilots who visit this ground should, however, remember that sailplane pilots are entirely dependent upon air currents to sustain themselves. This seems to have been forgotten by some visitors, who have " shot-up " a sailplane while it was soaring over the ridge, " inconveniencing " its pilot and jeopardising his safety to no small extent. A sailplane in the slipstream of a power-driven aircraft is not unlike a small sailing boat in the wash of a large liner—pilots should remember that.

Airport News

PROPOSED AERODROME AT MUDEFORD

ONE of the first cases of its kind has recently been decided in connection with the proposal of the Fisher Aviation Company to establish an aerodrome at Mudeford, on the outskirts of Christchurch.

The company, the partners in which are Mr. F. C. Fisher, R.A.F.O., and Mr. H. Clive Smith, submitted plans for an aerodrome to the local authority. These were rejected by the Council on the ground that they conflicted with the local Town Planning Scheme. The company promptly appealed to the Ministry of Health, and a public inquiry was held at Christchurch on March 27, presided over by Mr. W. D. Lockhart, of the Ministry of Health. At the hearing Mr. Alan Goodfellow represented the appellants, who were opposed by the Town Clerk of Christchurch, on behalf of the Council, and various local solicitors representing interests in the neighbourhood.

The main points of the opposition were:—

(*a*) That the establishment of an aerodrome would spoil the development of the area for residential purposes.

(*b*) That the noise of the aeroplanes would seriously interfere with the amenities of the district and would be injurious to public health.

(*c*) That the site selected was too far away (6½ miles) to serve Bournemouth, and at the same time too near (one mile) for the comfort of Christchurch.

(*d*) That it would have an injurious effect on a local nursing home about 1,000 yards away.

(*e*) That the aeroplanes would be a danger to Christchurch's historical buildings.

(*f*) That the aeroplanes would interfere with Divine Service.

Particularly strong objections were raised on this last point owing to the visit of an Air Circus one Sunday last year. It was alleged that the machines on this occasion had repeatedly flown round the church tower during the hours of Divine Service at a very low height, and that the owners had explained, in answer to complaints, that the direction of the wind made this unavoidable, notwithstanding the fact that the church was nearly three-quarters of a mile away from the flying ground. There was also strong opposition by local builders, who were afraid of the effect of an aerodrome on their building schemes.

For the appellants, Mr. Goodfellow called Mr. F. C. Fisher himself, Mr. Ivor McClure, of the A.A., who had inspected the site as an aerodrome consultant, Mr. James Hembrow, F.R.I.B.A., who gave expert evidence in connection with aerodromes from a town planning point of view, Mr. Forder, the editor of the *Christchurch Times*, who gave evidence as to local feeling in the matter, and Councillor F. Clarke, who, although the oldest member of the Council and himself a builder in the locality, was all in favour of aviation and progress generally. In this connection it is interesting to note on the cross-examination of the witnesses opposing the aerodrome that all of them claimed to be in favour of the development of flying and establishment of aerodromes—provided that the aerodromes were not established near them!

As the result of the Inspector's report to the Ministry of Health, the Fisher Aviation Company has now been informed that its appeal has been allowed, which will presumably mean that the local authorities of Christchurch will have to alter their town planning scheme and give the proposed area the full benefit and protection of being scheduled as an aerodrome.

It is interesting to note that at last year's Airports Conference the Minister of Health gave an assurance that his department appreciated the importance of aerodromes and landing grounds, and this case may be taken as an indication that the Minister is prepared to implement his assurance in all proper cases.

CROYDON

THE summer time-tables of most of the companies are now out. It is on May 1 that summer really starts at Croydon with intensified flying and white cap covers to keep fevered uniformed people's heads cool. I have seen the summer time-tables of Sabena, K.L.M., and D.L.H., but not those of the British and French companies. Brussels is to have three services a day in each direction, two by Sabena and one by Imperial Airways. London is also to be linked with Ostend and Le Zoute seven days a week by Sabena from June until the end of September. Paris, I hear, is to have ten services a day in each direction, five of them British and five French. I do not know how often a passenger could travel to Paris and back in a day, but I see from the K.L.M. time-table that if I left Croydon at 7.0 a.m. any day I could be in Amsterdam at 9.5 a.m. and return at 1.15 p.m., landing at Croydon 3.15 p.m. I could then leave by the 7.0 p.m. machine for Holland again and, having thus wasted a working day, I could get up early and leave Amsterdam at 7 a.m. next morning, reaching Croydon at 9 a.m. and being in my London office by 9.50 a.m. I do not necessarily recommend this intensive travel. I merely point out that it can be done—which shows what excellent facilities the various air traffic companies offer to the travelling public.

On Thursday morning last, bright and early, a number of eminent newspaper air correspondents, conducted by Mr. Schmidt-Ress, of the Germany company, left Croydon for Berlin by K.L.M. and returned next day by D.L.H. The flights served to underline what the Dutch and German companies are offering in the way of fast travel between the British and German capitals.

There has been considerable activity at the Airport on the part of the "Argosies" of Imperial Airways, which wise old aeroplanes have been assisting a number of pilots to pass out as "first officers," much, we may imagine, as an experienced riding school cavalry charger helps recruits to pass out. People are saying, without any particular authority, that this increase in the number of "commanders" is to do with the forthcoming activities of Railway Air Lines, Ltd., on various internal routes.

On Sunday last there was additional stir and bustle when "Sunderland," after playing The Arsenal on Saturday, set forth from Croydon by air to have a go at Lille. They defeated that team, largely, no doubt, owing to the exhilarating effect of air travel on footballers. Including supporters, they were 21 strong, and they were led by the Mayor of Sunderland. An "Argosy," the *City of Manchester*, and a Westland "Wessex," piloted by Messrs. Rogers and Wilcockson respectively, took them to Lille and brought them back on Monday afternoon.

Last Friday the first of the improved schedule Empire services of Imperial Airways came in from Africa, doing Capetown to London in nine days instead of ten. We have grown accustomed to seeing the African mail on Saturdays. The Singapore-Indian air mail will also have a day cut off its old schedule.

I understand that Olley Air Service, Ltd., has not only a great deal of work on hand at the moment but that several important and very interesting "special charters" are coming along in the near future. Up to recently, most of this company's flights seem to have been northwards, but just lately it has been a case of Westward Ho! Falmouth, Hayle, Teignmouth, Torquay and Shaldon have all been visited owing to a series of haphazard inquiries for immediate quick transport from various clients of Capt. G. P. Olley.

The summer season being upon us, it may be expected that the authorities may start upon the improvements, which have been talked about quite enough now, in the

main Customs Hall, where the passengers who now have to pass through Customs first and passport examination last, will, when the improvements have taken place, have their passports examined whilst they are waiting for their luggage to be unloaded and brought to the baggage counter. It will save considerable time and we may, if we are lucky, see the new system in operation before May, 1935.

Nobody will accuse the authorities of precipitate action in the matter of the lowering of the radio beacon here. At a meeting at Croydon on January 16, 1934, summoned by the Air Ministry, the unanimous opinion was expressed that the beacon mast was a definite cause of danger, both to aircraft taking off and to those landing along the chalk line in conditions of foggy weather. A pilot must take off along the chalk line in foggy weather—and the beacon mast still stands exactly where it did.

A. VIATOR.

HESTON

DURING the past twelve months the various departments of Airwork, Ltd., have reported business increases of from 25 to 50 per cent. These have led, among other things, to the construction of a new hangar, stores extension and passenger hall ; the forthcoming expansion of the landing area by 56 per cent., and the visit of the Technical Director and the Chief Accountant to the Business Efficiency Exhibition in September last. This latter excursion resulted in a step which is expected to give increased cohesion to the business by keeping up-to-date statistics at the finger tips of the directors and accounting staff by means of the installation of the Powers-Samas system, which machines sort and tabulate the essential details of business transactions at gross rates of between 4,000-24,000 items per hour.

As regards last week's activities, Señor A. S. Alejandro, who holds a high position in the Spanish Air Force, cleared Customs on April 19 in a new "Leopard Moth," which is being delivered to the Spanish Government for general conveyance purposes. On April 12, Birkett Air Service carried a large consignment of television sets to Sheffield for distribution. They had been manufactured by the Mervyn Company, working day and night to meet a rush order, and were actually the first television sets to travel by air. Prince Alvaro and Prince Alonso of Orleans-Bourbon were successful in obtaining their British "A" licences before returning to Zurich.

Mr. John Grierson, who three years ago made a record flight from India to England, and last year unsuccessfully attempted a North Atlantic flight by seaplane, left Heston by air for Paris on April 14, after his marriage to Miss Frances Hellyer. They travelled in the same "Gipsy Moth" aeroplane which has become famous in connection with his long-distance flights.

MANCHESTER AIRPORT

SPECIAL golf tours can now be arranged, for foursomes visiting noted championship courses, at prices ranging from £2 per head for a visit to Southport and Hoylake, leaving sufficient time at each course for a round. For example, a foursome leaving Barton at 8.0 a.m. could play a round at Machrihanish Golf Course, Cambletown, at, say, 10.0 to 10.30 a.m., lunch at the hotel, proceed to Renfrew for the Killermont Course, arriving at approximately 3.0 p.m. and stay there the night.

On the following morning they could fly to Leuchars for St. Andrews, starting their round at 10.0 a.m., lunch there and proceed to East Heslerton for the Ganton Course, arriving at about 4.0 p.m. Leaving Heslerton after a round, they could be back at Barton before dark. The price for this two-day tour is £12 10s. per head, flying mileage being approximately 600.

The Bellanca has been used for several long-distance joy-rides, including a flight over the Lake District with five passengers, a flight over Liverpool Docks and to Delamere Forest, in addition to six local flights.

During the week ending April 11, school flying had increased considerably. Four new pupils have joined the school, one of them having already purchased his own aeroplane. Mr. C. Munton and Mr. J. Rigg have qualified for their "A" licences.

ALMAZA AIRPORT

MR. DERICK RAWNSLEY, a cousin of Maj. Rawnsley, of the 12th Lancers, at present stationed in Egypt, arrived at Almaza on a brief Cairo visit on April 4, flying his Australian-registered "Moth" specially built for long-range flying and capable of 12 hours duration in flight. Mr. Rawnsley, who is still up at Oxford, flew from Australia, where he went a year ago, taking out a number of children from the London slum clearance scheme, and after a short experience of sheep farming he acquired his present machine to fly home, where he is to resume his studies. He left Almaza on April 8 to fly to England by easy stages, sight-seeing on the way.

Mr. J. Barbour, accompanied by Mr. Cairns Smith, flying a "Gipsy Moth," arrived from England at midday on April 6, and departed the same afternoon for China.

El Ferik Peake Pasha, the Officer Commanding the Transjordan Arab Legion, flying his metal "Moth," arrived on April 7 from Amaan, where he returned on April 10.

Prof. Pope, who hails from America, arrived from Europe with a party of ten on a chartered K.L.M. machine on April 7, and left on Tuesday *en route* for Syria, Turkey and Persia.

Mr. Yanda, General Manager of the Bata Boot Eastern Company, arrived from Czecho-Slovakia on the Bata "Puss Moth" on April 10, and after a short stay in Cairo is proceeding on to Calcutta.

Mr. Asfar left for Damascus on April 7, flying his Klemm aircraft.

Mr. Rodoconnaci, a pupil of the Misr Airwork Flying School, flew a Misr Airwork "Moth" to Jericho on April 7 and returned to Cairo on April 9. Taher Pasha, another Air School pupil, flew a "Moth" to Alexandria.

Cloud flying

AMENDMENTS to Notice to Airmen No. 92 of the year 1933 and FLIGHT, pages 203-204, March 1, 1934:—The following alterations and additions should be made. (A) to the map.—*Area 9*: No cloud flying is at present being carried out within this area. The area as shown on the map should therefore be an area bounded by straight lines joining Warmley-Hawkesbury, Upton-Batheaston and Warmley. *Area C*: Insert the figure "14" within the area. *Bircham Newton Area*: Revise boundaries to conform to the following:—Straight lines joining King's Lynn, Downham Market and North Walsham—thence by the coast line to King's Lynn. *Area 15 (New Area)*: Add a circular area within a radius of 10 miles of Yeovil aerodrome, as a civil area. (B) To Appendix 1.—*Area 9*: No cloud flying is at present being carried out within this area, the revision of which is under consideration. The area as shown should therefore be temporarily deleted. *Area No. 14.—Add Castle Bromwich (Midland Aero Club)*: This area is used by arrangement with the Officer Commanding No. 605 Squadron, Royal Air Force, Castle Bromwich. *Area 15 (New Area).—Westland Aircraft Works*: An area within a radius of 10 miles of Yeovil aerodrome. *Note.*—On Mondays, Fridays and Wednesday mornings No. 12 Squadron, R.A.F., Andover, have priority in this area. *Appendix 2.*—After *"Castle Bromwich" add "(also Midland Aero Club : see Appendix 1, Area No. 14)."*

THE ROYAL AIR FORCE

London Gazette, April 17, 1934

General Duties Branch

The follg. Flying Officers are granted permanent commns. in this rank (April 13) :—M. V. Ridgeway, N. C. Singer. The follg. are granted permanent commns. as Pilot Officers with effect from April 3 and with seny. of the dates stated :—W. N. Ash (Oct. 3, 1932) ; C. L. Dann (April 3, 1933).

The follg. are granted short service commns. as Acting Pilot Officer on probation with effect from and with seny. of April 3 :—G. L. Cruickshanks, M. H. de L. Everest, C. N. Fleming, D. P. Frost, M. Hallam, D. B. Harrison, J. W. Hathorn, G. A. Kitching, J. R. Leggate, A. A. McMath, E. K. Piercy, S. G. Pritchard, J. D. T. Revell, G. A. Richmond, R. E. Sharp, D. C. Torrens. The follg. Acting Pilot Officers on probation are confirmed in rank and graded as Pilot Officers :—A. Green (March 3) ; R. Mowbray Hall (March 24). P/O. W. B. Murray is placed on the half-pay list, Scale B, from Feb. 14 to March 7 inclusive.

The follg. Flying Officers are transferred to Reserve (April 13) :—Class A.—H. R. Black, E. L. Brackenbury, W. K. Brett, E. H. Coleman, E. E. Ellison, R. Ellison, G. D. Fleming, J. E. Loverseed, W. R. A. Matheson, P. R. May, E. J. K. Megaw, D. A. Messiter, G. W. Phillips, A. E. Smith, R. Smith, F. Whittingham. Class C.—G. M. Gillan.

Wing Comdr. R. C. Hardstaff is cashiered by sentence of General Court Martial (April 5).

Medical Branch

Flt. Lt. R. L. C. Fisher, M.B., B.Ch., is promoted to rank of Squadron Ldr. (April 7).

Memorandum

Gazette, May 18, 1926, concerning 2nd Lt. C. F. Killelea is cancelled.

ROYAL AIR FORCE RESERVE
RESERVE OF AIR FORCE OFFICERS

General Duties Branch

F/O. F. Ellam is transferred from Class A to Class C (March 29) ; F/O. F. Dismore relinquishes his commn. on completion of service and is permitted to retain his rank (March 4) ; F/O. V. C. Taylor relinquishes his commn. on completion of service (March 31).

Accountant Branch

F/O. B. C. Powell relinquishes his commn. on completion of service and is permitted to retain his rank (Jan. 15).

AUXILIARY AIR FORCE

General Duties Branch

No. 607 (COUNTY OF DURHAM) (BOMBER) SQUADRON.—P/O. J. E. McComb is transferred to No. 600 (City of London) (Bomber) Squadron (March 26).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Wing Commander D. Harries, A.F.C. to Station H.Q., Ramleh, 17.3.34, to Command vice Wing. Com. E. B. Rice.

Flight Lieutenants : B. C. Yarde to No. 101 (B) Sqdn., Andover, 5.4.34. R. H. Barlow to Marine Aircraft Experimental Establt., Felixstowe, 10.4.34. J. Bradbury, D.F.C. to Marine Aircraft Experimental Establt., Felixstowe, 10.4.34. B. M. Cary to No. 2 Armament Training Camp, North Coates Fitties, 24.3.34. F. J. Fogarty, D.F.C. to Air Armament School, Eastchurch, 8.4.34. H. L. Patch to No. 2 Armament Training Camp, North Coates Fitties, 24.3.34.

Flying Officers : A. H. Garland to No. 20 (A.C.) Sqdn., Peshawar, India, 5.3.34. G. A. L. Manton to No. 605 (County of Warwick) (B) Sqdn., Castle Bromwich, 29.3.34. R. W. P. Collings to No. 3 Armament Training Camp, Sutton Bridge, 10.3.34. T. A. Jefferson to No. 1 Armament Training Camp, Catfoss, 17.3.34. A. Threapleton to No. 2 Armament Training Camp, North Coates Fitties, 24.3.34. Hon. G. R. Ward to No. 811 (F.T.B.) Sqdn., 6.4.34. M. F. D. Williams to No. 812 (F.T.B.) Sqdn., 6.4.34.

Pilot Officers : The following Pilot Officers are Posted to No. 3 Flying Training School, Grantham, on 3.4.34. on appointment to Permanent Commns. :—W. N. Ash, C. L. Dann, J. G. Davis, E. Shipley.

Acting Pilot Officers : The following Acting Pilot Officers are Posted to R.A.F. Depot, Uxbridge, on 3.4.34, on appointment to Short Service Commns. :—G. L. Cruickshanks, M. H. de L. Everest, C. N. Fleming, D. P. Frost, M. Hallam, D. B. Harrison, J. W. Hathorn, G. A. Kitching, A. A. McMath, E. K. Piercy, S. G. Pritchard, J. D. T. Revell, G. A. Richmond, R. E. Sharp, D. C. Torrens.

Stores Branch

Flight Lieutenants : M. F. Tomkins to Aircraft Depot, Iraq, Hinaidi, 23.3.34. F. W. Felgate to Administrative Wing, Cranwell, 10.4.34.

Flying Officer C. L. Thompson to No. 20 (A.C.) Sqdn., Peshawar, India, 7.3.34.

Accountant Branch

Flying Officers : J. R. Ackers to No. 30 (B) Sqdn., Mosul, Iraq, 22.3.34. L. Chegwidden to Station H.Q., Hinaidi, Iraq, 22.3.34.

Medical Branch

Flight Lieutenants : R. L. C. Fisher to R.A.F. Depot, Uxbridge, 11.4.34. C. R. Palfreyman to School of Army Co-operation, Old Sarum, 10.4.34. G. W. Paton to Med. Training Depot, Halton, 9.4.34.

Dental Branch

Flying Officer W. V. A. Denney to Medical Training Depot, Halton, 9.4.34, on appointment to a non-permanent Commn.

SUMMER CAMPS OF CADRE AND AUXILIARY AIR FORCE SQUADRONS

While attending their annual camp the Cadre and Auxiliary Air Force Squadrons carry out normal service training.

Cadre Squadron	*Camp*	*Date*
No. 500 (County of Kent) (Bomber)	Tangmere	April 29–May 12.
,, 501 (City of Bristol) (Bomber)	Manston	July 22–August 4.
,, 502 (Ulster) (Bomber)	,,	July 15–28.
,, 503 (County of Lincoln) (Bomber)	Hawkinge	July 22–August 4.
,, 504 (County of Nottingham) (Bomber)	,,	,,
Auxiliary Air Force Squadron		
No. 600 (City of London) (Bomber)	Tangmere	July 29–August 12
,, 601 (County of London) (Bomber)	Lympne	,,
,, 602 (City of Glasgow) (Bomber)	,,	July 13–27.
,, 603 (City of Edinburgh) (Bomber)	Manston	July 22–August 5.
,, 604 (County of Middlesex) (Bomber)	Tangmere	,,
,, 605 (County of Warwick) (Bomber)	Manston	August 5–19.
,, 608 (North Riding) (Bomber)	,,	August 12–26.

ARMAMENT TRAINING CAMPS

No. 1 Armament Training Camp—Catfoss

April 23–May 27	No. 207 (Bomber) Squadron.
May 21–July 1	,, 12 (Bomber) Squadron.
May 28–June 24	,, 58 (Bomber) Squadron.
July 2–July 22	Nos. 33 and 101 (Bomber) Squadrons.
July 30–August 26	
August 27–September 16	No. 9 (Bomber) Squadron.
September 24–October 7	
October 1–October 21	Nos. 500 (County of Kent), and ,, 503 (County of Lincoln) (Bomber) Squadrons.
Fleet Air Arm Units	
June 18–July 8	No. 821 Squadron.
July 9–July 29	,, 820 Squadron.
August 27–September 16	,, 823 Squadron.

No. 2 Armament Training Camp—North Coates Fitties

April 30–May 27	No. 10 (Bomber) Squadron.
May 14–June 17	,, 35 (Bomber) Squadron.
May 28–July 1	,, 40 (Bomber) Squadron.
July 2–July 22	Nos. 18 and 57 (Bomber) Squadrons.
July 30–August 26	
August 27–September 23	,, 7 and 99 (Bomber) Squadrons.
September 24–October 14	,, 501 (City of Bristol), and 504 (County of Nottingham) (Bomber) Squadrons.
Fleet Air Arm Units	
June 18–July 8	No. 811 Squadron.
July 9–July 29	,, 810 Squadron.
March 19–April 22	,, 4 (Army Co-operation) Squadron.
March 19–April 29	No. 26 (Army Co-operation) Squadron.
March 26–April 29	,, 2 (Army Co-operation) Squadron.
March 26–May 6	,, 16 (Army Co-operation) Squadron.

No. 3 Armament Training Camp—Sutton Bridge

March 26–May 6	No. 13 (Army Co-operation) Squadron.
April 2–May 13	,, 23 (Fighter) Squadron.
May 14–June 3	Nos. 41 and 54 (Fighter) Squadrons.
June 4–24	,, 32 and 56 (Fighter) Squadrons.
June 25–July 15	No. 3 (Fighter) Squadron.
July 16–July 22	Nos. 19 and 25 (Fighter) Squadrons.
July 30–August 12	
September 3–September 23	,, 1 and 111 (Fighter) Squadrons.
September 24–October 14	,, 17 and 29 (Fighter) Squadrons.
Fleet Air Arm Units	
June 25–July 15	No. 800 Squadron.
August 13–September 2	,, 802 Squadron.

AFFILIATIONS OF R.A.F. FIGHTER TO R.A.F. BOMBER SQUADRONS

Squadron	*Affiliated to*	*Date*
No. 23 (F)	No. 101 (B) Squadron at Andover	June 4–30.

AFFILIATIONS OF R.A.F. FIGHTER SQUADRONS TO R.A.F. FLYING BOAT SQUADRONS

Squadron	*Affiliated to*	*Date*
No. 56 (F)	No. 201 (F.B.) Squadron at Gosport	May 17–31.

AFFILIATIONS OF FIGHTER SQUADRONS OF THE REGULAR AIR FORCE TO AUXILIARY AIR FORCE AND CADRE SQUADRONS

Squadron	*Affiliated to*	*Date*
No. 1 (F)	No. 600 (City of London) (B) Squadron at Hendon	April 28–May 6.
,, 3 (F)	No. 603 (City of Edinburgh) (B) Squadron at Turnhouse	May 25–June 3.
,, 19 (F)	No. 602 (City of Glasgow) (B) Squadron at Abbotsinch	April 28–May 6.
	No. 608 (County of Durham) (B) Squadron at Thornaby	May 12–20.
,, 29 (F)	No. 604 (County of Middlesex) (B) Squadron at Hendon	April 28–May 6.
,, 41 (F)	No. 501 (City of Bristol) (B) Squadron at Filton	April 28–May 6.
,, 43 (F)	No. 601 (County of London) (B) Squadron at Hendon	May 12–20.
,, 111 (F)	No. 504 (County of Nottingham) (B) Squadron at Hucknall	April 28–May 6.
	No. 605 (County of Warwick) (B) Squadron at Castle Bromwich	

The Industry

A Rolls-Royce Appointment

LT. COL. M. O. DARBY, O.B.E., Vice-Chairman, Racing Committee, Royal Aero Club, has been appointed to the aviation department of Rolls-Royce, Ltd. Col. Darby has had considerable experience in aviation, both during and since the war, and was formerly Managing Director of Aircraft Disposal Co., Ltd., and Cirrus Aero Engines.

"G.Q." Parachutes

MR. R. F. DAGNALL, the proprietor of the well-known manufacturers of flotation gear, the R.F.D. Co., has now joined the board of the "G.Q." Parachute Co., Ltd., who will have their head office and works at Stoke Road, Guildford, Surrey. Although in the past "G.Q." parachutes have been manufactured at the Guildhall works of the R.F.D. Co., the new factory will be a completely separate concern.

Free Instruction

MESSRS. HENLYS, LTD., of Heston, have instituted a scheme whereby all purchasers of aeroplanes from them will be given free instruction up to a maximum period of eight hours, which should be sufficient to enable the majority of people to obtain their "A" licence. In view of the fact that this offer applies both to new and to secondhand machines, and that some of the latter are listed at Henlys at less than £200, this offer certainly represents a step which should do a great deal towards increasing private ownership and assisting flying.

Progress of Brian Lewis & Co., Ltd.

AFTER the appointment of Brian Lewis & Co., Ltd., as managing distributors for the de Havilland Aircraft Co., Ltd., a slight reorganisation of the distribution of areas for de Havilland aircraft was made. Brooklands Aviation, Ltd., retained the southern portion of England as their area for de Havilland sales, and have increased this by the inclusion of Northamptonshire. Marshall's Flying School of Cambridge is the D.H. distributor for Huntingdon, Cambridge and Norfolk, and Phillips & Powis deal with Berkshire, Buckinghamshire and Oxfordshire. Brian Lewis & Co., Ltd., have taken premises at Renfrew Aerodrome, under the control of Mr. McNeil, late of Midland & Scottish Air Ferries, from which it is hoped to organise sales for the North of England and for Northern Ireland. At Heston, Mr. Page, the sales manager, deals with southern and central parts, and at Hooton Mr. Gairdner is responsible for the area of the big manufacturing towns. We are informed by the company that its total flying time now exceeds five thousand hours, and that this experience is entirely at the disposal of customers.

Northern Heights Model Flying Club

WE would remind readers who may be interested in the activities of the above club that the Grand Gala Rally, to which all model aircraft clubs and model aircraft flyers are invited, will be held on Sunday, July 8, at the Great West Road Aerodrome, Yiewsley, near West Drayton, Middlesex, by kind permission of C. R. Fairey, Esq., and the Fairey Aviation Co., Ltd. Will members please note that the address of the Hon. Chairman, Mr. Charles A. Rippon, is now "Melita," 70, Hampden Way, Southgate, N.14. Readers interested in the activities of the club should write for information to this address, enclosing a 1½d. stamp.

Briefly

THE Hendon Country Club—Shades of Claude Grahame White!—has now become the Police "University."

THE ROOF of the hangar at the Manchester Airport has been painted white from the ridge down to the top of the roof lights.

OWING to exigencies of payload and range the "Leopard Moth" will not, after all, be fitted with a "Gipsy Six."

MR. PEARSE has, we understand, resigned his position with Wrightson & Pearse of Heston.

SQD. LDR. C. S. WYNNE-EATON has joined Mr. Wrightson, and the Le Touquet service will have his special care.

❖ ❖ ❖ ❖

PUBLICATIONS RECEIVED

The War in the Air. Vol. IV. By H. A. Jones. London: Humphrey Milford, Oxford University Press. Price 17*s.* 6*d.* net.

Aeronautical Research Committee Reports and Memoranda: No. 1552. *Methods of Visualising Air Flow.* By K. W. Clark. May, 1933. Price 1*s.* net. No. 1563. *Abstract: A Survey of the Air Currents in the Bay of Gibraltar in* 1929–30. By J. H. Field and R. Warden. November, 1933. Price 6*d.* net. London: H.M. Stationery Office, W.C.2.

Aeronautics. Handbook of the Collections Illustrating Aeronautics. II. Lighter-than-Air Craft. Science Museum, South Kensington. By M. J. B. Davy. London: H.M. Stationery Office, W.C.2. Price 2*s.* 6*d.* net.

U.S. National Advisory Committee for Aeronautics Reports. No. 473. *Strength Tests of Thin-Walled Duralumin Cylinders in Compression.* By E. E. Lundquist. Price 10 cents. No. 475. *Wing Pressure Distribution and Rotor-Blade Motion of an Autogiro as Determined in Flight.* By J. B. Wheatley. Price 5 cents. No. 476. *Relation of Hydrogen and Methane to Carbon Monoxide in Exhaust Gases from Internal-Combustion Engines.* By H. C. Gerrish and A. M. Tessmann. Price 5 cents. Superintendent of Documents, Washington, D.C., U.S.A.

Nineteenth Annual Report of the U.S. National Advisory Committee for Aeronautics, 1933. Superintendent of Documents, Washington, D.C., U.S.A. Price 10 cents.

Technical Notes of the U.S National Advisory Committee for Aeronautics: No. 481. *The Reduction in Drag of a Forward-Sloping Windshield.* By E. N. Jacobs. December, 1933. No. 482. *The Effect of Spray Strips on a Model of the P3M-1 Flying-Boat Hull.* By J. R. Dawson. December, 1933. No. 483. *Charts for Determining the Pitching Moment of Tapered Wings with Sweepback and Twist.* By R. F. Anderson. December, 1933. No. 484. *A Method of Calculating the Performance of Controllable Propellers with Sample Computations.* By E. P. Hartman. January, 1934. No. 485. *A Comparison of Several Methods of Measuring Ignition Lag in a Compression-Ignition Engine.* By J. A. Spanogle. January, 1934. No. 486. *The Effect of Trim Angle on the Take-off Performance of a Flying Boat.* By J. M. Shoemaker and J. R. Dawson. January, 1934. No. 487. *Tests of Three Tapered Airfoils Based on the N.A.C.A.,* 2200, *the N.A.C.A.-M6, and the Clark Y Sections.* By R. F. Anderson. January, 1934. No. 488. *A Complete Tank Test of a Flying-Boat Hull with a Pointed Step—N.A.C.A. Model No.* 22. By J. M. Shoemaker. February, 1934. No. 489. *Aerodynamic Characteristics of Anemometer Cups.* By M. J. Brevoort and U. T. Joyner. February, 1934. U.S. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

Memorandum on the Economic Situation in Hungary: 1933. April, 1934. Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

Apia Observatory Annual Report for 1932. N.Z. Department of Scientific and Industrial Research. G. H. Loney, Government Printer, Wellington, New Zealand. Price 5*s.*

❖ ❖ ❖ ❖

PATENT AERONAUTICAL SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1932

Published April 26, 1934

17,528. BENDIX AVIATION CORPORATION. Method of and system for controlling the supply of liquid fuel to an internal-combustion engine. (407,925.)

26,566. D. NAPIER AND SON, LTD., and C. W. SEWELL. Flexible mountings for engines. (407,974.)

27,654. E.M.B. Co., LTD. and S. SMITH. Air-brake valves. (408,011.)

36,368. E. R. ARMSTRONG. Construction of floating-stations for aircraft. (408,071.)

APPLIED FOR IN 1933

Published April 26, 1934

20,025. SIEMENS AND HALSKE A.-G. Rudder-steering installations for air or water craft. (408,122.)

29,056. E. G. BUDD MFG. CO. Flying-boats. (408,165.)